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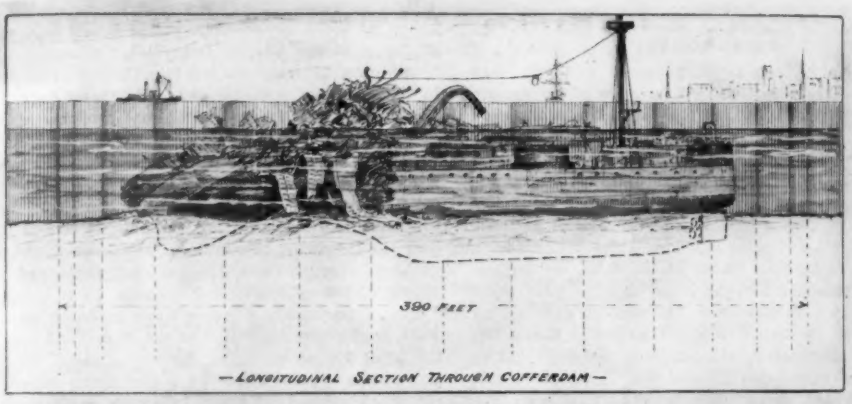
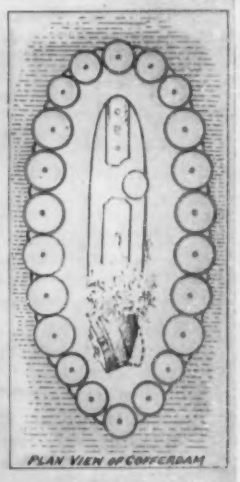
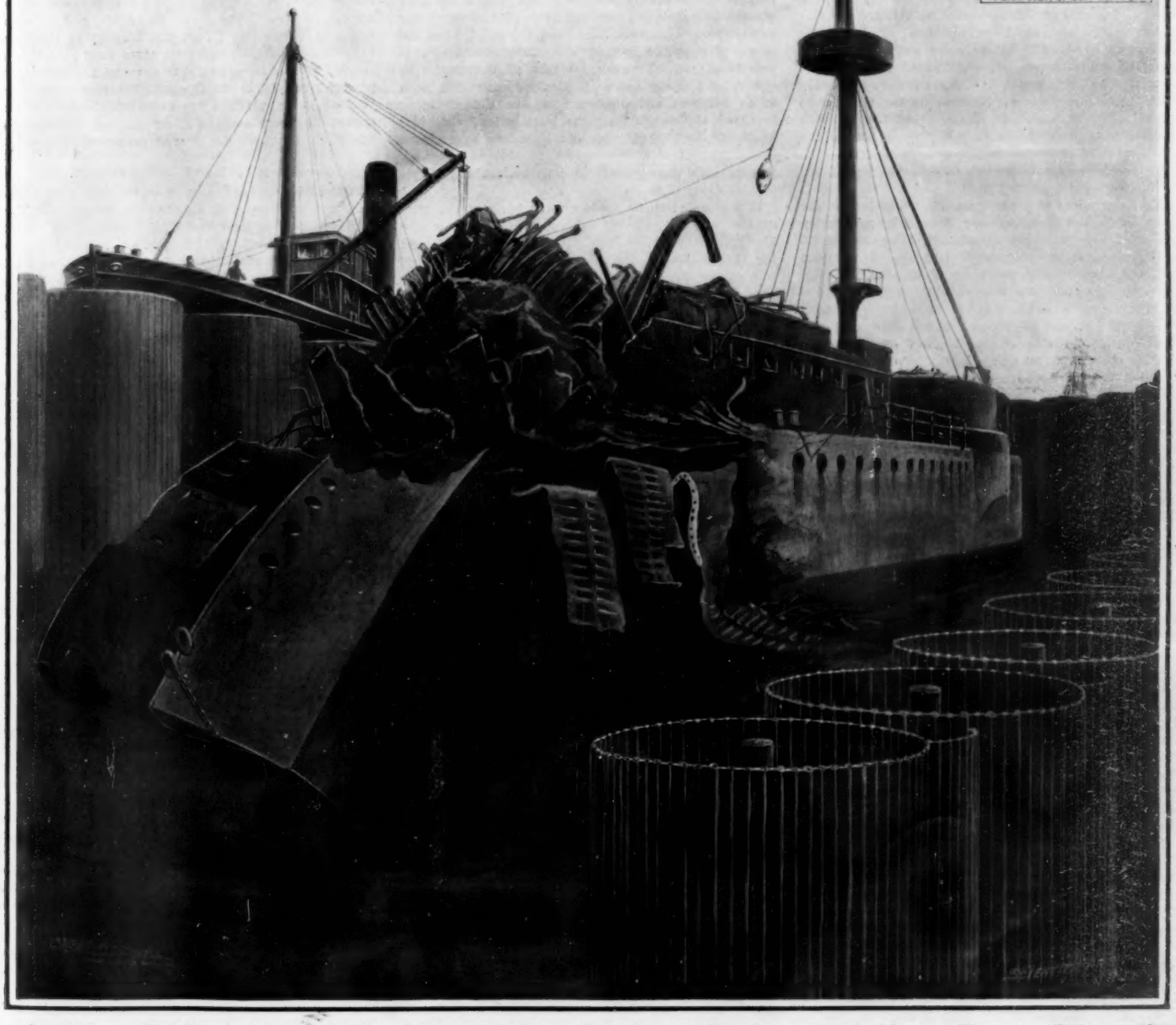


—LONGITUDINAL SECTION THROUGH COFFERDAM—



PLAN VIEW OF COFFERDAM



A continuous wall of 50-foot, steel-pile, clay-filled cofferdams will be driven around the wreck through the mud to hard bottom. The water will be pumped out, the mud removed, and the condition of the hull determined.

HOW THE ARMY ENGINEERS WILL UNCOVER THE "MAINE."—[See page 499.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, SATURDAY, DECEMBER 24th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE CENSUS OF 1910.

IN a country of such phenomenal growth in population as the United States, it is natural that the forecasts of population should exceed the actual returns of any given census. Therefore it is very significant that the figures recently completed for the census of 1910 should greatly exceed the preliminary estimates of the census experts. The population of the United States, excluding Alaska and our island possessions, has been announced by the Census Bureau as 91,972,267. As the army and navy are not yet fully reported, we may put the population of the continental United States in round numbers at 92,000,000. This represents an increase during the decade of 21 per cent, which is two and one-half millions greater than that of the decade 1890 to 1900. The significance of this will be realized when it is stated that previous to the present decade, the percentage of increase had been falling.

To the student of these statistics, there is food for thought in the fact that the growth of population has been very unevenly distributed. The most striking feature is the enormous increase of 1,329,000 which has taken place in the city of New York, an increase for which there is absolutely no precedent. Furthermore, the adjacent towns to the north doubled in population, and very large gains were made on the New Jersey side of the Hudson River. If we include these suburban districts, the gain in the actual Greater New York was not far short of two millions; and an estimate of population on the basis of a "metropolitan district," as in the case of London, proves that the total would run up to not far short of seven millions. Moreover, the rate of growth is increasing, as is shown by the fact that from 1900 to 1905, the increase was 115,000 a year, whereas from 1905 to 1910 it has reached the astounding figure of 151,000. There is nothing in the rest of the country to match the growth of New York; and the nearest approach to it, it is interesting to note, is to be found in the wonderful development which has taken place on the Pacific slope. Here we find that California, which added to its population 825,000 souls in the three decades of 1870 to 1900, has added in the past decade an even greater number, or 892,000. The State of Oregon, which had hitherto shown a disappointing rate of growth, has now leaped forward with an increase of over sixty per cent. The thriving State of Washington, however, has far exceeded this, the increase being 120 per cent. San Francisco is no longer alone on the coast in being reckoned as one of the great cities of the United States; for that distinction must now be accorded to Seattle, Portland, and Los Angeles, cities which a quarter of a century ago were merely thriving towns of modest proportions.

Much has been said and written of recent years about the new South, and the figures of the census give indisputable proof that the old order has passed away and that the new era is one of lusty growth. The increase in Texas and Oklahoma has been phenomenal. Birmingham, Alabama, has the distinction of being the first southern city of over 100,000 inhabitants to show the largest percentage of gain of any of the cities in that class throughout the United States. An interesting question is that of the causes which have checked or at least greatly moderated the rate of growth of the famous agricultural States of the Mississippi valley. A gain of less than 200,000 each is a surprisingly small advance for such States as Kentucky, Missouri, and Indiana. The great State of Iowa has even suffered a slight loss of population. Immigration, as was to be expected, has been a potent factor in bringing the figures for the continental United States up to their present high mark. It is found that nearly nine million immigrants entered the country during the last ten years; but because of the large number that have returned to their native lands, and loses incurred through death and other causes, the census officials estimate the net gain from immigration at about six millions. If this be correct, there has been an increase of ten millions among the native born population.

If Alaska, Hawaii, Porto Rico, the Philippines (credited with about seven and a half million), Guam, Samoa, and the Canal Zone at Panama are included, the total population of the United States and its possessions is in round numbers 101,100,000.

IS THE UNITED STATES OR GERMANY THE SECOND NAVAL POWER?

IN his Navy Year Book, prepared and published under the direction of Congress, Mr. Pitman Pulsifer, once clerk of the Senate Committee on Naval Affairs, places the United States in the second place among the navies of the world. On the other hand, the office of Naval Intelligence, whose means of gathering accurate information are particularly effective, places Germany in the second position, with the United States a close third. Comparing the vessels completed, under construction or authorized, the statistics for the close of this year show that Great Britain possesses 548 vessels, aggregating 2,173,838 tons in displacement; the United States has 177 vessels aggregating 878,152 tons; Germany 255 of 963,845 tons aggregate; France 448 ships of 725,331 tons; Japan 181 ships totalling 493,671; Russia 211 ships of 201,463 tons total displacement; and Italy 171 vessels of 327,059 tons total. In spite of Germany's strenuous efforts to defeat Great Britain's scheme to maintain a navy equal to that of any other two powers combined, the United States, when all points that make for efficiency are considered, is nearly, if not altogether, abreast of Germany. In completed tonnage and in battleships completed, both as to numbers and displacement, the United States is ahead of Germany. If the "Charleston," "Milwaukee," and "St. Louis" are considered to be armored cruisers (and they are placed in this category by foreign authorities) the United States leads Germany in this class of vessels.

If a comparison be made on the basis of the total number of guns of large caliber carried, such as the 11, 12, 13, and 14-inch gun, Germany has a lead over the United States. On the other hand, about 50 per cent of the German guns are of 11-inch caliber. The United States, on the other hand, carries in the main battery no gun of less than 12-inch caliber, and a large proportion of its 12-inch pieces are of the latest and most powerful pattern. It is contemplating also the provision of twenty 14-inch guns, of which powerful weapon Germany has none whatever projected. It is interesting to note that Mr. Pulsifer expects that the next battleships will be of 32,000 tons displacement, and that they will mount the 16-inch gun.

In spite of the arguments adduced to the contrary, we are inclined to accept the estimate of the Bureau of Naval Intelligence, and consider that Germany is at least abreast of the United States at the present time, and that she will have an increasing lead over her as the years pass by. This will be due to the larger number of dreadnoughts, both of the battleship and the cruiser types, which are under construction and authorized by that power. Rightly or wrongly, the naval powers have staked their all upon the dreadnought ship. The type is so powerful that the first battle line of the future must necessarily consist of ships of huge displacement, of high speed, heavily armored, and carrying ten or a dozen guns of the largest caliber. To-day, Germany possesses four vessels of this type afloat and nine under construction. When the vessels now building have been completed Germany will be able to place thirteen dreadnoughts in the first line of battle, and the United States ten. In the second line of battle, which will include ships of the "Connecticut" and "Deutschland" class, carrying a mixed battery, the United States will be stronger. This counts for something, and in the event of a fight to the death between the first line, it is conceivable but not likely that the second line might turn the tide of battle in favor of the navy that was weaker in ships of the dreadnought class.

OUR WEALTH IN FARM PRODUCTS.

IT is a truism that the agricultural wealth of this country is its largest asset, and that the prosperity of the country at large is more dependent upon the farms than upon any other of its resources. Never was this fact so strikingly brought home as in the figures published by the Secretary of Agriculture in his recent annual report. "Nothing short of omniscience can grasp the value of the farm products this year," says the Secretary, and he places their value at the stupendous figure of $8,926,000,000. This represents an increase in value over that of 1909 of $305,000,000; and there can be little doubt that the Secretary is justified in his statement that, at no time in the history of the world, has any country equaled this record.

As usual, the corn crop bulks the largest and represents by far the greatest valuation, which amounts, this year, for 3,121,381,000 bushels, to about $1,500,000,000. The yield is even greater than that of the record year, 1906, and it exceeds the average crop of the preceding five years by 14 per cent. That billion and a half of money is sufficient to cancel the interest-bearing debt of the United States, buy up all the gold and silver mined throughout the world in 1909, and "still leave to the farmers of the country," says the Secretary, "a little pocket money."

Next in value to the corn crop is the cotton crop, valued at about $900,000,000. Then follow hay, valued at 720 millions; Spring and Winter wheat, 625 millions; oats, 380 millions. While there was a decline in the farm value of all crops of 119 millions, there was a gain in the value of animal products of about 424 millions. The past year has been one of high prices for meat and animals, and for poultry, eggs, milk, and butter.

Exports of farm products amounted in 1910 to about 871 millions. Among these, cotton was the principal item, to the value of about 450 millions; followed by packing-house products, 136 millions; grain and grain products, 133 millions; and tobacco, 38 millions.

The Department of Agriculture is doing excellent work in the administration of the Pure Food Law and the Meat Inspection Law. Last year about fifty million animals were inspected before being killed, and the total number of cases in which meat was condemned at the packing houses numbered 987,000. It is gratifying to learn that the Secretary sees a steady improvement in the method and management of the packing houses. The total value of fines collected under the Food and Drugs Act during the year was $11,049, and 990 food and drug cases were reported, of which 766 were for criminal action, and 224 for seizure proceedings. Of criminal cases, 246 resulted in convictions, 3 in verdicts for defendants, 96 were dismissed, 152 were pending in courts, and 252 remained under consideration for future action.

THE SPECTER OF THE BROCKEN.

THE name of this phenomenon suggests a startling and uncanny apparition. In German it is called *Brockengespenst*, "Brocken ghost," which implies something even more weird and unearthly. However, according to L. Schwarz, who sends to Das Wetter a lively description of the specter, as seen on the Schneekoppe, the highest mountain in Prussia, the impression that it makes upon the beholder is merely that of a highly interesting, but not at all alarming optical phenomenon.

It is best seen in winter, when the sun is at a low altitude throughout the day. It may then be visible for hours together. Given a bank of fog or cloud on the side of the mountain opposite the sun, and not too far from the observer, the shadow of the latter will be seen projected on the mass of vapor; the head surrounded by a "glory" of prismatically colored light, and the whole shadow surrounded, at a considerable distance, by a dazzling white fog bow, the so-called "white rainbow." The impression of colossal size is, as is well known, an optical illusion, due to an overestimate of the distance of the shadow from the observer.

It may be interesting to note, though Herr Schwarz does not mention this fact, that there is great confusion, even in authoritative reference books, as to the terminology of this phenomenon. It is called the specter of the Brocken because first described as seen on the Brocken, but it may be seen in all parts of the world. Many writers have followed Mascart in applying the name to the glory of colored light surrounding the shadow; it should, however, be applied to the whole phenomenon, including the glory, which is called specifically the *Brocken-bow*. The exterior ring of white light is not a "white rainbow," but is a true halo, and is sometimes called *Bouguer's halo*. Mascart called this *Ulloa's circle*, but the latter term is now usually applied to the colored rings, or sometimes to the whole specter and its attendant phenomena. It is named in honor of Antonio de Ulloa, who saw the specter in Peru and wrote a classic description of it in the eighteenth century.

It may be mentioned, incidentally, that the whole terminology of atmospheric optics is in a state of almost hopeless confusion. Writers are quite at loggerheads with one another (and often with themselves) as to the meaning attached to such words as "halo," "corona," "glory," "aureole," etc. It seems likely, however, that the great "Meteorologische Optik" of Pernter and Exner, recently finished, will ultimately serve as a norm in such matters.

ENGINEERING.

Already plans are being made for operating new steamship lines which will take advantage of the shortening of distance due to the opening of the Panama Canal. The Royal Mail Packet Company of England is seeking a mail subvention over a route from England to Jamaica and through the Panama Canal to Valparaiso and Callao, and also for a line from New York to Callao and Valparaiso through the canal. The Japanese will subsidize a line from New York, *via* Panama, to the same South American ports.

Lord Fisher, Admiral of the British fleet, in the course of a recent interview in this country, expressed his conviction that the coming thing in navigation is the motor engine. It is his belief that the nation which first takes hold of this engine will sweep the board commercially. We agree with him that steam as a propulsive power may ultimately give place to the gas engine; but the transformation will scarcely take place within the present decade. The mechanical problems to be overcome are many and extremely difficult.

Much interest is being excited in the attempt of the "Mauretania" to make a round trip between Liverpool and New York within a fortnight's time; if possible, within twelve days. The loading and unloading and coaling operations at the port of New York were organized with a view to the greatest possible expedition. In addition to the embarking and taking on board of the vast amount of Christmas mail and express matter, it was necessary to put into the bunkers in 36 hours between six and seven thousand tons of coal—a feat of no little magnitude in itself.

The service of hourly express trains over the Central Railroad of New Jersey between New York and Philadelphia is the only express service running the year round which ranks with the fast express service in England and France. The trains have recently been accelerated, and the first to be operated easily lived up to the new time-table, covering the distance between the two cities at an average speed of 61.01 mils an hour, and reaching Philadelphia 2 minutes, 45 seconds ahead of schedule time. On short and favorable stretches of the road, a speed of slightly over 90 miles an hour was maintained.

With the recent opening of an extension of the Post Office pneumatic tube service in New York, from 103rd to 125th Streets, the Post Office has at its service a very complete system covering Manhattan Island. It consists of an east side and a west side branch, between the general Post Office at City Hall Square and 124th Street, with cross connections on that street and on Forty-second Street. There is also a line to Wall Street and the Custom House building at Bowling Green, a line to the Hudson Terminal Station, and one running across the Brooklyn Bridge to the Brooklyn general Post Office.

The introduction of 13½-inch and 14-inch guns, respectively, in the British and United States navies marks a return to practice which was common some thirty years ago. At that time, the British "Inflexible" carried a 16-inch, 80-ton gun; and ten years later a 16¼-inch piece, weighting 110½ tons, was mounted in three British battleships. France mounted a 16½-inch gun on several ships, a 14½-inch, 75-ton gun on two battleships, and a 13.3-inch weapon on five other vessels. Italy in the same period mounted several 17 and 17.72-inch guns. The present upward trend in calibers will probably continue until the largest pieces of earlier days have been exceeded.

In these days, when the construction of costly fleets of dreadnought battleships, the erection of fortresses, the building of guns of ever-increasing size and power, and the marshaling and training of armies running into the millions of men, are so much in the public eye, the munificent gift by Carnegie of $10,000,000 for the promotion of international peace is an event of strong dramatic interest. The success of this noble venture will depend greatly upon the methods by which the annual available funds of $500,000 are applied to the end in view. The motive forces which set in movement the enginery of war lie too deep to be reached and bought off, even by such a sum as this. Indirectly, however, it must exert a potent influence.

All hourly records for concrete laying were broken on October 6th, 1910, by the cableways used in constructing the great locks on the Panama Canal at Gatun. Two million cubic yards of concrete are to be used in building these locks. Lidgerwood cableways are used for placing the concrete. These cableways are arranged in duplex form on four pairs of towers. The pair of cableways which broke the record are known officially as "Strand A" and "Strand B" of cableway No. 1. Strand A placed 49 cubic yards in one hour, and Strand B placed 50 cubic yards during the same hour. This means that the carriage on each strand made 25 trips per hour. The cableways were sold under a guarantee that they would make 20 trips per hour.

ELECTRICITY.

The temporary tomb of Mary Baker Eddy, founder of Christian Science, is lighted with electricity, and is equipped with a telephone. A guard is stationed at the tomb, and watch is kept day and night. In the meantime, a large mausoleum is being built, in which Mrs. Eddy's body will be permanently placed.

A plan is on foot to use the power at Great Falls on the Potomac River for a hydro-electric plant to generate current for consumption in the District of Columbia. At present 4,458 horse-power is required, but the power available at Great Falls, even at low water, is considerably over 6,000 horse-power, and by using a storage reservoir above the falls, it could be increased to about 8,650 horse-power.

By the simple expedient of placing a locomotive headlight on a derrick, and using therewith an arc lamp of 3,000 candle-power, it was possible to continue excavation work night and day on the Evanston channel of the Chicago drainage canal. The headlight automatically followed the movement of the bucket, so that the process of excavation at night was made very simple. Whenever it was desired to diffuse the light, the lamp was thrown slightly out of focus.

Some time ago we referred in this column to the novel method of raising kegs of nails from a sunken vessel in the Mississippi River by the use of electro-magnets. This method has suggested to the Navy Department, that torpedoes which have gone to the bottom because of some defect can be raised in a similar manner. Hereafter, in practice firing, when a torpedo is lost, the approximate point at which it sank will be marked with a buoy, so that the region may be explored with an electro-magnet, and the torpedo be thus recovered. The lifting power of the magnets will not have to be very great, owing to the buoyancy of the torpedo in the water.

A novel type of trailer is being used by the Pittsburg railway companies. The principal peculiarity lies in the fact that it is a pay-as-you-enter car with a vestibule at the center, and none at the ends, thus facilitating the work of the conductor, who is the only official on the car. As the car is a trailer, it is possible to use trucks with wheels of smaller diameter than would be required on a power-driven car. The floor level of this trailer is only 20 inches above the rail, which facilitates mounting and dismounting from the car, only one step being required. The car has a seating capacity of 62, and with a motor car, provides a train with a capacity of 118 seats.

Electric light and power companies are adopting a new method of securing customers. A classified list is taken from the telephone directory, and usually between the hours of eight and nine in the evening a number is called up on the telephone, and the head of the house is informed that the company is making a canvass of the street, and would like to know whether he is willing to consider electric service similar to that of his neighbors. This plan, when tactfully carried out, has proven very successful, resulting in securing a large number of customers without much expense, and without waste of time.

One of the most beautiful examples of illumination is that of the Allegheny County Soldiers' Memorial in Pittsburg. Here the architect and illuminating engineer have co-operated to produce a splendid effect. The banquet hall of the building is 120 feet wide, and the ceiling is 65 feet from the floor. The ceiling is broken up into panels which are illuminated from above with flaming arc lamps to give yellow light, nitrogen lamps to give a pink light, and mercury-vapor lamps to give a bluish light, the colors being modified by the use of colored opalescent glass. Particularly attractive is the sky-blue effect produced by the use of the mercury-vapor lamps and blue-tinted glass. In addition to this indirect illumination, a certain number of naked tungsten lamps are used to bring out architectural features that would otherwise be lost.

It is interesting to study the rivalry between copper and aluminium as conductors of electric current. The conductivity of aluminium is but three-fifths of that of copper. On the other hand, it is so much lighter that, pound for pound, aluminium is a better conductor than copper. The cost of aluminium is slightly greater than that of copper, but not sufficiently greater to prevent it from being a cheaper conductor if bare wire is used; but when we come to insulated wire, copper has an advantage over aluminium, because in wires of the same conductivity the cross section of the copper would be less than the cross section of the aluminium conductor, and hence would require less insulation, due to its smaller diameter. This, however, holds only below certain sizes, for the conductivity depends upon the cross-sectional area, and the latter varies as the square of the diameter, so that in the end aluminium wins the race for the large insulated conductors.

SCIENCE.

An interesting use has been found in astronomy for the bicycle wheel. By fitting such a wheel with a series of opaque screens placed at regular intervals and then rotating it, with the aid of a small motor, at the rate of from thirty to fifty turns in a minute before the cameras used to photograph meteors, one investigator has succeeded in measuring the velocity of the meteor's flight. The principle depends upon the interruptions produced by the screens in the trails of light made upon the photographic plates by the flying meteor. The velocity of the wheel is known at every instant by means of a chronographic record, and the length of the interruptions indicates the speed of the meteor.

The publication by the Royal Society of Edinburgh of the observations made on Ben Nevis and at Fort William from 1883 to 1904 has been completed by the issue of Vol. xliv. of the transactions of that society. On account of its size the volume has been issued in two parts. The publication of this mass of meteorological data, and of the pertinent discussions, which has cost from first to last about £1,800, has been a great national undertaking, and is no doubt the most elaborate presentation of the data of a single observatory extant. The closing of the institution on Ben Nevis, a few years ago, owing chiefly to the withdrawal of government assistance, was a calamity that meteorologists all over the world have not yet ceased to deplore.

The influence of petroleum on the growth of plants has been studied by Kryz. The experiments were made by watering plants of stramonium and plantain with water containing ten per cent of petroleum. No injurious effect is produced unless the petroleum accumulates in considerable quantities about the roots of the plants, that is to say, when it is possible for petroleum to be absorbed by the roots. The application of petroleum makes the soil physically and physiologically dry, and the plant gradually perishes in consequence of the difficulty of absorbing water. No directly poisonous action of petroleum, like that which it exerts on animal organisms, occurs in the case of plants. The fermentation of solutions of sugar is not checked by an addition of petroleum.

The French Department of Fine Arts is taking measures to prevent prehistoric or archtological finds from leaving the country. The matter came up recently on the subject of the remarkable cave drawings which are found at Eyzies in the Dordogne region, as well as prehistoric implements. Foreign archæologists were installing themselves here and taking out a great many finds. A bill is now presented to Parliament tending to protect archæological discoveries. Among other measures, a special museum is to be founded at Eyzies and this will become a center of archæologic and ethnographic study. The new regulations will cover the questions of ancient objects belonging to churches, also the matters of libraries, and of manuscripts.

A new instrument for measuring nocturnal terrestrial radiation, invented by the late Knut Angström, is described by his son, A. K. Angström, Jr., in Annalen der Physik, under the name of "condensation-actinometer." Excepting an external cylinder of metal, the instrument is made entirely of glass. It consists of a reservoir, exhausted of air, and containing ether, into which projects a glass chamber, open above to the air, and coated with lampblack. The blackened surface radiates heat more rapidly than the rest of the apparatus, and tends to lower the temperature within the reservoir; this cooling is, however, compensated by the condensation of ether, which distills over into a graduated glass tube. The total amount of radiation from the black surface during a given interval is proportional to the amount of ether condensed. Its value in thermal units may be obtained by the use of a constant, determined by comparing the instrument with other forms of actinometer.

A very interesting discovery was made in Spitzbergen last summer by the Isachs expedition. In a cove of Wood's Bay, in the northern part of the island, hot springs were found which, in connection with other volcanic phenomena, justify the conclusion that an active volcano existed in this region in comparatively recent geological times. The springs, eight in number, are distributed along one straight fissure and have well-developed geyser terraces. The cone of the volcano itself is very regularly formed, and resembles the craters of Vesuvius and Aetna. The volcanic minerals found in the vicinity are of the slag type, and consist partly of olivin. The situation and appearance of the volcano prove that it is more recent than the glacial epoch, and must have been in eruption in the Quatenary period. A piece of pumice stone of peculiar appearance, which was found on the shore near Smerenberg by the Zeppelin expedition this year, and which was supposed to have drifted from Iceland, probably came from this volcano, which is not far distant.

WORKMEN'S MOLDED CONCRETE HOMES.

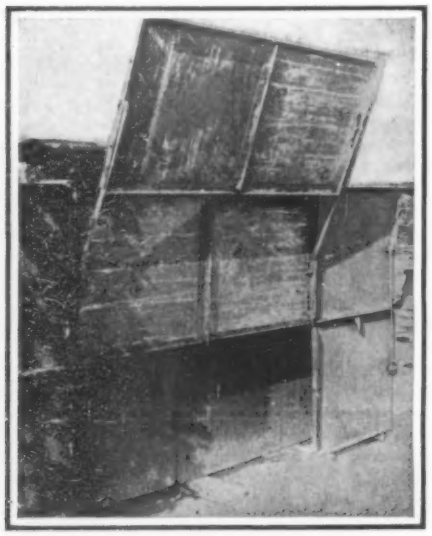
BY FRANK C. PERKINS.

In the problem of acquiring a method of construction of model homes for workingmen, a concrete house has been designed and erected with special steel molds by Milton D. Morrill, a young architect of Washington, D. C.

In order to reduce the cost of the concrete work to a minimum, he devised a simple steel mold, the plates taking up the mold being of unit type (as shown in the accompanying illustration) so that they are interchangeable, and can be adapted to almost any dimensions and designs.

The mold plates making up the equipment are pressed from 12 gage sheet steel into 24-inch square flanged sections. Upon the completion of the footing course the plates are locked to the cement spacing blocks, and form a trough about the walls, into which the mixture is poured. The cement spacing blocks are of course left in the wall, and the plates are locked together strongly with these blocks or spools and then drawn to perfect alignment on the inside.

The whole stands very rigid and firm when erected, while the corners give alignment to keep the work straight and plumb. The plates are two tiers in height, each tier being clamped together in series, and attached by a hinged rod, so that the lower tier is unlocked and swung to its new position



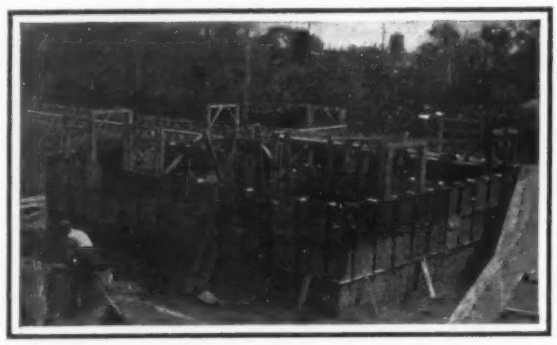
View showing lower tier being swung into place, forming one side of trough into which concrete mixture is poured.

on top each day, there being no loose parts to fall.

The whole equipment for house construction has only ten different parts, and costs about $500. As it can be used indefinitely, the expense per hour is not great. There are no cast parts to break, and there is nothing to get out of order. All parts are of pressed steel, so that if a plate should fall and bend, it can be straightened easily.

It is of interest to note that galvanized iron or wood fillers are used to take up off dimensions. These plates are locked together in the same way for the floor, the spacing blocks here giving the exact thickness of the slab, and reinforcement rods are placed and accurately secured to these blocks by wire with the ends protruding for this purpose.

The joints are held by steel wedges, an arrangement which makes for speedy erection, as there are no bolts of threads to rust. A slight ridge or pattern is left at the joining of the mold plates, and spacing blocks show slightly. This has been treated as a wall decoration; and with the rosette cast on the spacing blocks, an extremely interesting pattern is formed, and it is possible to leave the wall without further finish inside or out, unless a brush coating is applied to give a more uniform color, and as a safeguard against dampness. As the plates are cleaned and greased each time that they are raised, and as the concrete is a very wet mix, an extremely smooth surface is obtainable, requiring no plaster and little patching. A small per cent of clay is added to the



Method of building by two tiers of steel plates locked together and spaced apart to form a trough for casting walls and partitions. Window and floor frames are simply dropped in place and walls are cast around these.

mix, which gives a homogeneous damp-proof wall, and which prevents the settling of the aggregates; this makes the mix of the consistency of molasses.

It is of interest to note that a wet mix is used in these molds, requiring stirring only, and it is found that this is the best and the cheapest way to make a damp-proof concrete. A brush coat of white cement is used to give a uniform color, and it serves as an additional precaution against dampness.

In case the houses are built in cold climates, an inexpensive waterproof insulating board is bedded in the middle of the walls; this feature prevents condensation, and gives a warm house in winter and a cool one in summer.

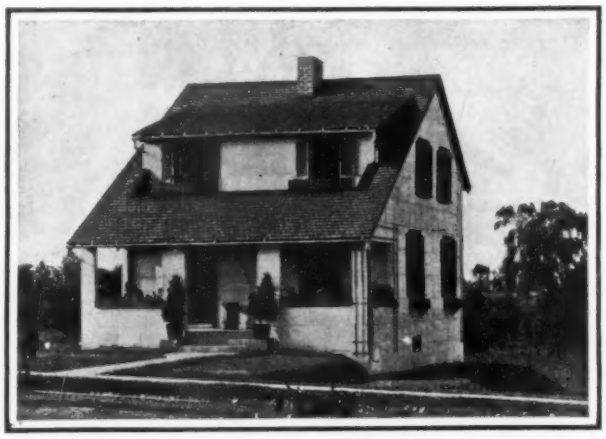
It would seem likely that these steel molds could be used to advantage in many other types of concrete structures, such as fences and farm buildings, and where a sanitary permanent structure is desired.

The window frames and the door frames are made the thickness of the wall and have a dovetailed strip nailed on the back, so that they are dropped into the molds and the walls cast around them.

It is true that these steel molds cannot be employed to advantage when the surfaces are cut up or curved, but wherever straight construction is employed, they can be used with a marked saving.

It is found that in the house shown under construction, the total cost of 6-inch walls was 10 cents per square foot, or about $5 per cubic yard. This brings the cost of form work down to one to three cents per square foot, where with wood it varies from five to ten cents.

The building shown in the accompanying illustration is at Virginia Highlands, in the vicinity of Washington.



VIEW OF FINISHED CONCRETE HOUSE.

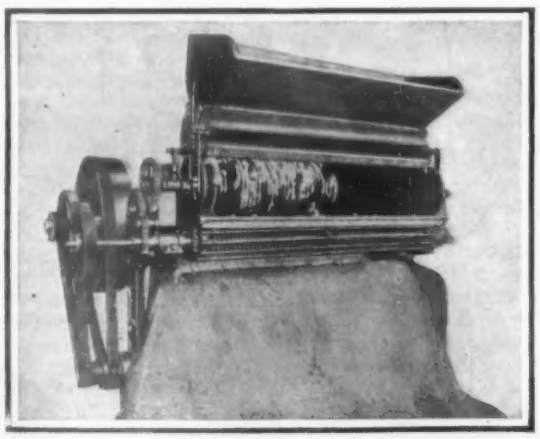
A NEW TEAZER COTTON GIN.

From the picking of cotton to the time when it emerges from the loom in the form of woven cloth, there are many mechanical processes which are demanded by the peculiar nature of the fiber. Various inventions, especially the cotton gin, and in more modern times the mechanical cotton picker, have more or less revolutionized the industry, but there are numerous opportunities for inventors to bring improvements to long-established processes. In the ginning of cotton, where the lint or fiber is separated from the seeds and foreign matter is found in the bolls as picked, the two main processes involve the use of the saw gin, improved from that invented by Eli Whitney, and the roller gin, a machine evolved from a primitive device used for centuries in India. The former is used with ordinary or upland cotton, which has a short and thick staple, as the individual fiber is termed. These fibers are separated by a series of rapidly revolving metal disks with saw teeth on their edges, which pass through grids, taking along the cotton fiber but leaving behind the seeds and the dirt. As there is but little space between the saws and the grids, this process is apt to injure the fiber, breaking or cutting it and rendering it less desirable for spinning. The roller gin, which is used for Sea Island cotton, where there is a longer but thinner staple, consists of revolving rollers with rough surfaces or a single roller and stripper blade between which the fiber is drawn out, while seeds and dirt are left behind. The roller gin is much slower and is not serviceable with short staple or upland cotton, though with the Sea Island variety it is used with advantage, as it produces a longer and a straighter fiber.

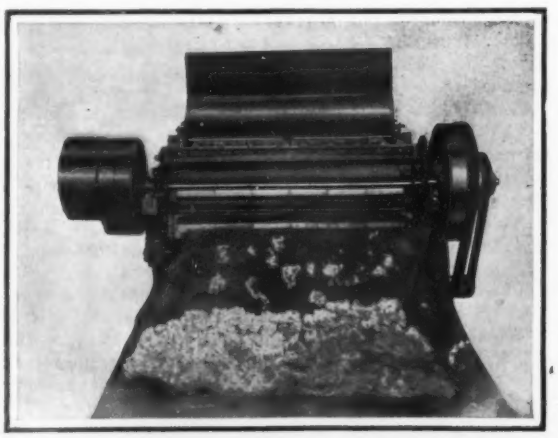
Recently there has been invented an improved teazer cotton gin, which combines the best features of these two fundamental types in practical form, being able to work on any kind of cotton and producing for the spinner a better grade of lint, that is without cuts, breaks, strains, or kinks, in which the full length of the fiber is retained. This American teazer cotton gin is the invention of James Brandon of New York, and has been tested during the past year in the South and at textile exhibitions. It consists of a hopper into which the cotton as it comes from the field is introduced, containing as it does along with the fiber seeds, leaves, dirt, and other foreign material. In this hopper are a series of circular gin saws revolving on an axle, but spaced somewhat wider apart than in the ordinary saw gin and affording a greater clearance space between the saws and the grids, so that the fiber is not broken, but considerable seed is carried down with it. In these processes, nails and matches (a prolific source of fire in cotton mills) and other foreign matter are easily eliminated without damage to the machine or the fiber.

The fiber thus loosened is then taken up by a teazer or series of traveling points of special design, by which it is still further loosened and carried along to a roller. This teazer device consists of a series of teeth operated by gearing, so that they always maintain a vertical position, rising to take the cotton and then falling after it is delivered to the ginning roll. By the use of this roll, never before feasible with a short staple cotton, the sliver thoroughly teazed or separated is passed between a blade and the

(*Concluded on page 508.*)



FRONT VIEW OF TEAZER COTTON GIN, SHOWING COTTON PASSING THROUGH GIN-SAWS.



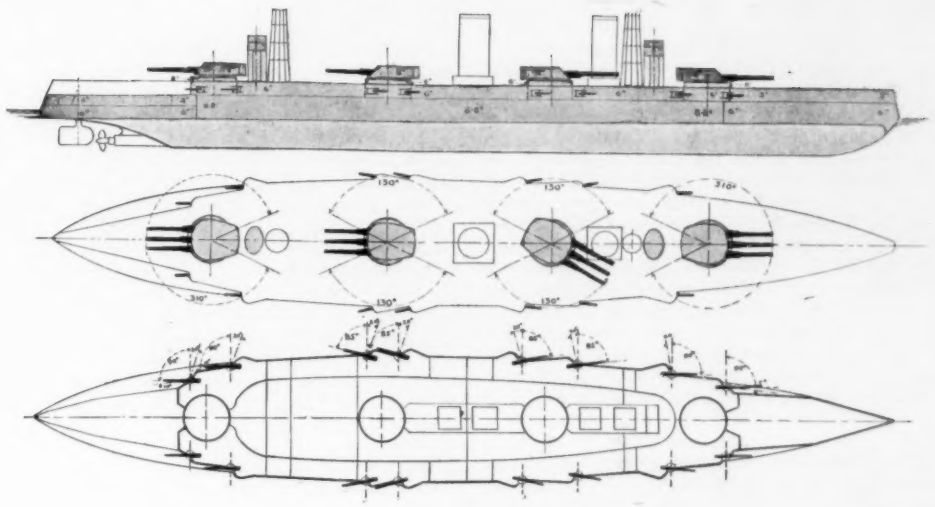
REAR VIEW OF TEAZER COTTON GIN, SHOWING COTTON COMING FROM THE MACHINE.

FOUR RECENT TYPES OF DREADNOUGHTS.

It is recognized that the Italians have always been in the van of progress in the evolution of the warship. Many of the most important features of naval construction have had their origin in the chief constructor's office of the Italian navy, and it is generally recognized that although England is to be credited with building the first dreadnought, Admiral Cuniberti was the first to outline this type of ship and indicate its valuable military features. Hence, a recent discussion of the four latest types of dreadnoughts by Luigi Barberis, captain Corps of Construction, Royal Italian Navy, possesses a special value. We present a digest of this paper by Capt. Barberis in the Revista Marittima, which digest will be followed next week by the publication of the paper in full in the SUPPLEMENT.

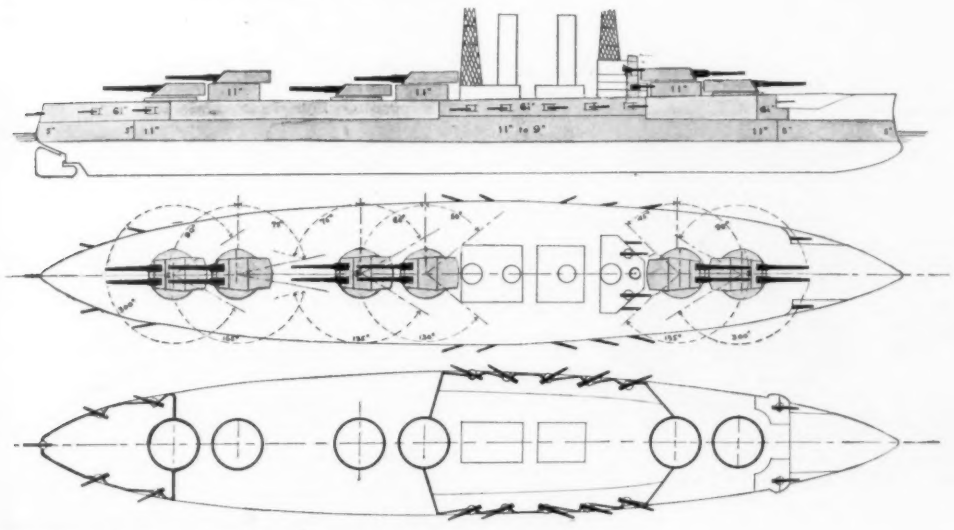
The four ships dealt with by Capt. Barberis are the Russian "Sebastopol" class of four ships, the American "Wyoming" and "Arkansas"; the Argentine "Rivadavia" and "Moreno," and the French "Jean Bart" and "Courbet."

"A comparison of the main battery is rendered easy by the fact that all the ships carry 12-inch guns.



Displacement, 23,000 tons. **Speed,** 22.5 knots. **Maximum coal supply,** 3,000 tons. **Armor:** Belt, 8¼ inches to 6 inches; turrets, 8 inches. **Armament:** Twelve 12-inch; sixteen 4.7-inch. **Torpedo tubes,** none.

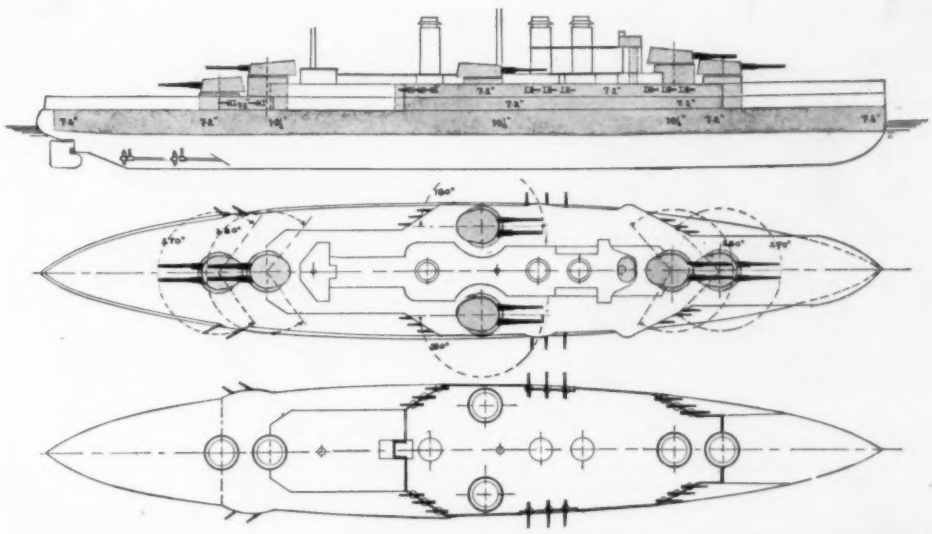
Russian "Sebastopol."



Displacement, 25,298 tons. **Speed,** 20.5 knots. **Maximum coal supply,** 2,500 tons; 400 tons oil. **Armor:** Belt, 11 inches to 5 inches; turrets, 11 inches. **Armament:** Twelve 12-inch; twenty-one 5-inch. **Torpedo tubes,** two 21-inch.

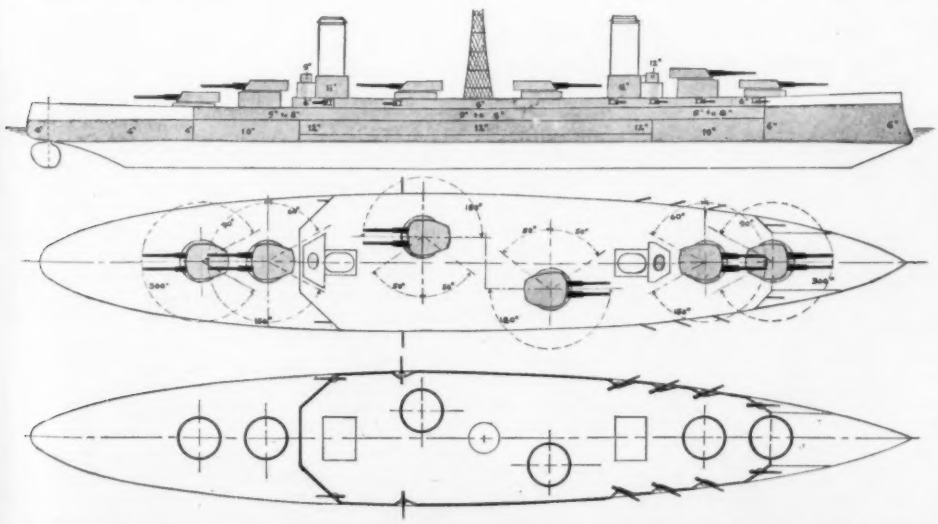
United States "Wyoming."

The French have sacrificed one-sixth of the gun power of their ships in broadside attack, merely to reinforce the bow and stern fire, a most serious defect," which, we may remark in passing, characterizes most of the English, German, and Japanese dreadnoughts. "The Americans are content with a fore-and-aft fire within fifteen degrees of each side of the keel line of but four guns, and the Russians have only three guns which can fire end on within twenty-five degrees of the keel line. The Russians, however, more than make up for the loss of end-on efficiency by a splendid broadside fire of all twelve guns throughout an arc of 130 deg. This they have achieved by mounting the guns in four three-gun turrets arranged on the longitudinal center line. The Americans have contented themselves with a maximum arc of broadside fire of but 95 deg., the French having 90 deg., and the Argentine ships 100 deg.



Displacement, 23,323 tons. **Speed,** 20 knots. **Maximum coal supply,** 2,700 tons. **Armor:** Belt, 10¾ inches to 7½ inches; turrets, 10¾ inches. **Armament:** Twelve 12-inch; twenty-two 5.5-inch. **Torpedo tubes,** four 18-inch.

French "Jean Bart."



Displacement, 27,555 tons. **Speed,** 23 knots. **Maximum coal supply,** 4,000 tons; 660 tons oil. **Armor:** Belt, 12 inches to 4 inches; turrets, 9 inches. **Armament:** Twelve 12-inch; twelve 6-inch; twelve 4-inch. **Torpedo tubes,** two 21-inch.

Argentine "Rivadavia."

FOUR RECENT TYPES OF DREADNOUGHTS.

"The torpedo-defense armament of the American ships consists of twenty-one 5-inch guns; of the Russian ships, sixteen 4.7-inch guns; of the French ships, twenty-two 5.5-inch guns; of the Argentine ships, twelve 6-inch and twelve 4-inch guns."

Capt. Barberis is in error in criticising the placing of the 5-inch battery of the "Wyoming" on the gun deck, on the presumption that these guns are too low. They are practically on the deck above, the sheer line of these ships having a continuous rise from the stern to the stem.

"The submarine armament consists in the "Jean Bart" of four underwater tubes; the "Wyoming" and the "Rivadavia" have each two tubes, but of the large diameter of 21 inches, and in the "Sebastopol" they have been altogether omitted."

In comparing the freeboard, Capt. Barberis notes that in the "Rivadavia" and "Jean Bart," there is a forecastle deck extending about two-thirds of the length. The "Jean Bart" has 23½ feet of freeboard at the bow, and 16 feet at the stern; the "Rivadavia" has respectively 26 feet and 17 feet. The "Wyoming," according to this authority, has 24½ feet at the stem, and falls in an unbroken sweep to 18¼ feet at the stern. The Russian "Sebastopol" has a continuous freeboard from stem to stern of about 18 feet. The maximum and minimum height of the guns are as follows: "Rivadavia," 40 feet and 22½ feet; "Wyoming," 37 feet and 25 feet; "Jean Bart," 38 feet and 21 1/3 feet; "Sebastopol," 29 feet for all guns.

In his study of the vertical armor protection, Capt. Barberis credits the "Rivadavia" with a main belt of from 12 inches to 4 inches, and the "Wyoming" with about the same. The "Jean Bart's" belt varies from 10¾ to 7½ inches, and the "Sebastopol" from 8⅝ inches to 6 inches. The captain is of the opinion that the Russian and Argentine ships conform more closely than the others to the modern idea of having a great portion of the side protected by armor. The

turrets of the Americans are 11 inches thick; of the French, 10½ inches; of the Argentine vessels, 9 inches; and of the Russians, only 8 inches thick.

The horizontal protection of the Argentine ships consists of two protective decks, one of which, probably the main deck, is 1½ inches thick, while below this is a 3-inch deck. The American ships have one protective deck 2 inches thick, with another of the same thickness in the wake of the magazines. The French have provided their ships with three armored decks, the uppermost 1.2-inch, the next 1.95-inch, and the lowest 2.78-inch.

"In the matter of speed, two schools of thought are represented. The Argentine ships are to have 23 knots, and the Russian vessels 22.5 knots, the Americans being satisfied with 20.5 knots, and the French with 20 knots. While the tendency is toward higher speed, Capt. Barberis points out that the Russians might have saved 2,000 tons, and the Argentines at least 3,000 tons had they been content with the speed of the "Wyoming" or "Jean Bart."

"In coal capacity the Argentines have inaugurated a new policy by giving their ships a coal capacity proportionate to their displacement, having 1,600 tons normal, and 4,000 tons maximum of coal, and 660 tons of oil fuel. The French have a maximum of 2,700 tons, and the Americans of 2,500 tons of coal and 400 tons of oil. The normal displacement of the "Rivadavia" is 27,533 tons, of the "Wyoming" 25,298 tons, of the "Jean Bart" 23,323 tons, and of the "Sebastopol," probably 23,000 tons."

Capt. Barberis is of the opinion that had the United States ships been designed with the same skill as the Argentines, they would have had 2,000 tons less displacement. We cannot agree with this conclusion, and we refer to an article we published in our issue of August 27th, in which, after comparing the two types on the common basis of their full-load displacement, we found that the United States ship, on about 3,000 tons less displacement, has better armor protection, equal battery, equal or greater freeboard, less speed on trial, and less radius of action.

In summing up, Capt. Barberis gives it as his opinion that the French ships are palpably inferior to the others in offensive force, while the Russian disposition of armament far outclasses the others. The advantages of an arc of maximum efficiency of 8 minutes, as against 117 minutes during which their ships were able to show their greatest offensive fire. These figures were respectively 20 and 105 minutes for the Russian squadron. Both sides, then, were able to concentrate their maximum gunfire for about 90 per cent of the action. In the second encounter, which began at 6:15 P. M. and ended at 7:10—or about 55 minutes—both the Japanese and the Russians maneuvered their vessels so as at all times to present to one another their greatest arc of fire.

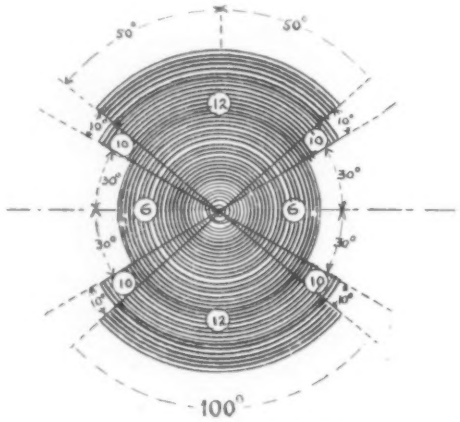
"For the details of the battle of Tsushima the world is indebted to the diagram and description of the American naval officer, White, which, taking it all in all, has remained one of the most reliable commentaries on that battle. The fight lasted from 1:55 in the afternoon until 4:15, some 140 minutes. During this action the Japanese fired end-on for a little less than 15 minutes, the Russians for as much as 30. All the rest of the time the ships were broadside to each other.

"Rear Admiral Wainwright, U. S. N., was altogether right when he said that the greater part of every sea fight would take place with the ships firing between the angles of 45 deg. and 135 deg. from the bow; and that a fair percentage of the remainder of the time would see the firing between 20 and 45 deg. and 135 and 160 deg.; with the negligible balance for end-on fire.

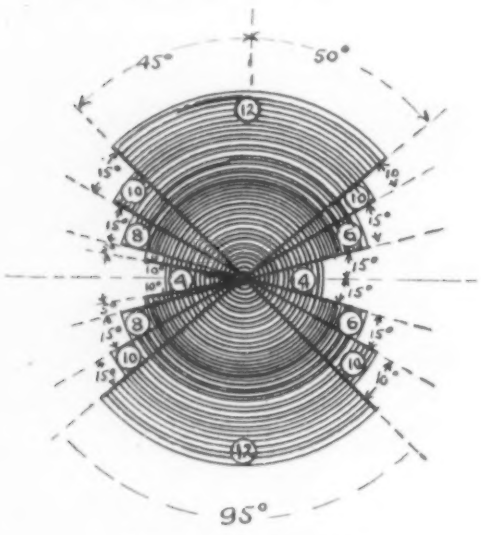
"It would appear from actual experience in the Russo-Japanese war, that this minimum is fixed at between 10 and 15 per cent. Now, does it seem worth while to sacrifice two guns (as the French have done) for 85 per cent of a battle, in order to have two more for 15 per cent of the time? And have not the Argentines themselves sacrificed some 30 deg. of their arc of maximum offense, in order to increase their actual fore-and-aft fire by two guns?

"As for the Americans, I cannot understand why they did not go further and adopt what looks like the best plan of all. We refer to the suggestions of Lieut. Defeo, of the Italian navy, for it was he who first called attention to the merits and strong points of that method of solving the question of systematization of artillery.

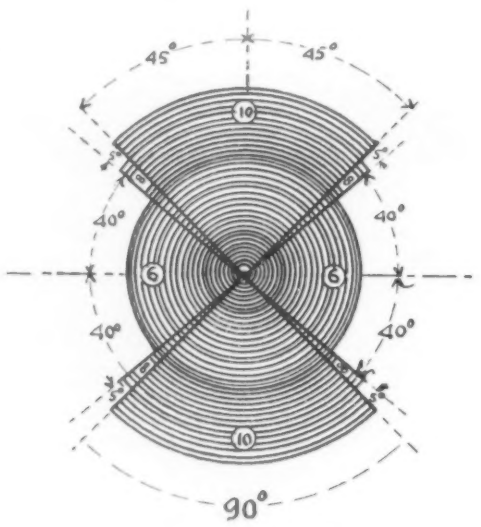
"Altogether, I think the Russian scheme by all means the best, and the French system the least good of all four types under consideration. On the other hand, we think the Russian disposition of the torpedo-defense guns very inferior, while the French have easily excelled in this, barring always the four guns in the stern. In the matter of protection, the Argentines rank first and the Russians last, but the differences are not very vital."



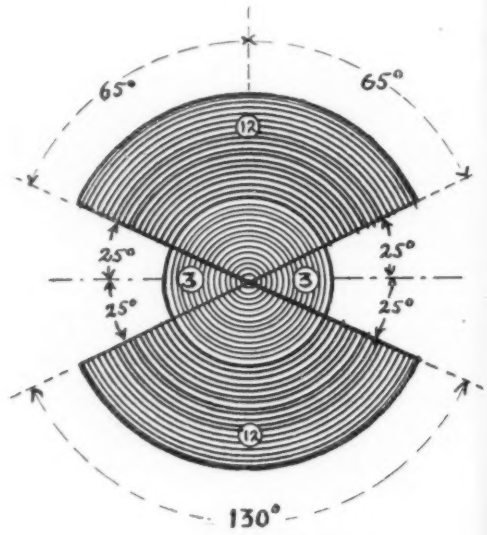
Argentine "Rivadavia."



United States "Wyoming."



French "Jean Bart."



Russian "Sebastopol."

Figures in circles show number of guns that can be concentrated within the respective shaded areas of fire.

DIAGRAMS SHOWING ARCS AND CONCENTRATION OF FIRE OF 12-INCH GUNS.

The Secretary of War on Military Aeronautics.

In his recently issued annual report the Secretary of War drives home our need of proper aeronautic equipment. Aerial navigation is attracting world-wide attention, he says. Marked progress has been made in this art during the past year. Its possible influence upon the art of war is much discussed among military authorities the world over. Recently in Berlin and Paris opportunity was afforded me to witness aviation tests that were being made there by the military, and I was impressed with the interest and activity displayed in the development of this new art with special reference to its possibilities for use in the military service.

Germany and France continue to lead in the development of air craft for military purposes. Germany has specialized in the development of the dirigible balloon, while France has paid more attention to the development of the aeroplane. Information from abroad indicates that at the present time Germany possesses 14 military dirigible airships and a number of aeroplane; France, 7 military dirigible airships and 30 aeroplanes. Reliable information from France, under date of September 6th, 1910, states as follows:

"The French aerial fleet will shortly be increased by 30 units. The Minister of War has in fact given an order for 10 Blériot monoplanes and 20 Farman biplanes, 7 of which can carry two passengers in addition to the pilot. The Blériot apparatus will be delivered within a month, and our officers will be in possession of the Farmans in three months at the latest. It will therefore be 60 aeroplanes that France will be able to place in line before the end of the year."

Late information received from France also indicates that the French government has recently ordered 11 new dirigibles of different dimensions, whose delivery will take place at different times within the next twelve months.

The following is an extract from a report of an officer of the United States army on the autumn maneuvers of the French army from September 15th to September 18th, 1910:

"But the most striking thing was the aeroplane. The French have made wonderful progress in this respect. I saw Lieutenant Pellenger in his monoplane rise right out of a wheat-stubble field. The biplanes and monoplanes were everywhere. They traveled with great speed and must have seen everything except where the troops could be concealed in the woods. An efficient aeroplane corps is certainly indispensable to an army."

The United States, which was the first nation officially to recognize the aeroplane for military purposes, and which conducted at Fort Myer, in 1908, the first public flight of a heavier than air machine, has since that date made no addition to its aeronautical equipment, which at present consists of one small practice dirigible balloon, one Wright aeroplane, and three small captive balloons; nor to its trained personnel, the Signal Corps at present having but one lieutenant and nine enlisted men on duty in connection with aeronautics. There is but one officer who is a licensed pilot for free balloons.

It is contended by some that dirigible balloons and airships will at best prove to be of doubtful utility in warfare. Others hold that the United States would better postpone expenditures until the

art has reached a more advanced state. The fact remains that all European first-class powers are devoting a great deal of attention to the subject of military aeronautics, and are displaying marked activity in the development and supply of both the dirigible and the aeroplane for war purposes, while the United States is practically at a standstill in this matter. In my judgment the time has come when it would be wise to make appropriations adequate for providing the Signal Corps with a reasonable number of the better type of machines for instruction purposes and for field work.

ARMY PLAN FOR UNCOVERING THE "MAINE."

The battleship "Maine" was sunk in Havana harbor in 37 feet of water. The supposed explosion of a mine beneath the ship, coupled with the explosion of the forward magazines, of which latter there is no doubt whatever, blew out the sides and deck of the ship, and practically cut her in two at about one-third of her length from the bow. The bow, connected to the rest of the hull only by what was left of the plating of the double bottom, instantly filled and bent over, sinking stem first to the bottom. Later the after two-thirds of the ship filled and sank, this portion of the vessel being practically intact. The wreck settled into the soft mud, the stern to a depth of eight or ten feet, the bow to a depth that has not been ascertained.

Practically nothing has been done in the intervening twelve years or more since the disaster, either to raise or remove the hull. The last Congress, however, appropriated $300,000 for uncovering the wreck, removing the bodies of the unfortunate crew that may yet be entombed, and making such disposal of the ship as may be decided upon. Several proposals were made to the War Department for raising the wreck, and one of the most practical of these was illustrated in the SCIENTIFIC AMERICAN of August 20th, 1910. This plan, as well as others that were proposed, contemplated lifting the ship bodily by means of wire cables and power screw jacks, or by similar means, clear of the water for examination.

The army engineers, however, decided that because the vessel was practically cut in two, it would be impossible to raise her in her present broken condition without further distorting the vessel and thereby preventing that careful examination of her present condition which is necessary to determine just exactly what manner of explosion it was, whether from without or from within, or both, that destroyed the ship.

Proceeding on the assumption that to make a survey of the ship exactly as she exists to-day, the hull must be examined *in situ*, and with the least possible disturbance of her position, the engineers have devised the exceedingly interesting method of uncovering the ship, which is illustrated on our front page issue. Briefly stated ,the plan consists of providing an elliptical watertight wall of cofferdams entirely around the wreck, pumping out the water from the space as thus inclosed, and removing the mud from the unwatered bottom so as to leave the hull open for a careful survey of its condition.

Beginning at a point opposite the bow, a cylindrical caisson, formed of interlocking steel sheet piling, will be driven through the mud until it enters the hard clay bottom, which in general is found about 70 feet below mean tide. To maintain the circular form, a central pile will first be driven, and around this, floating on the surface of the water, will be a circular platform 50 feet in diameter, which will act as a template to guide the pile drivers in putting down the sheet piling. Operations will be carried on along each wall of the cofferdam until closure is made at the end opposite the stern of the ship. Watertight joints will be formed by driving a segmental wall of piling between each pair of cofferdams, situated at a distance of nine feet from their point of contact. The cofferdam wall, as thus built up, will be filled with clay which will be dredged from a bar lying adjacent the wreck. The weight of this clay will in itself give the cofferdams sufficient stability to prevent their being overturned by the pressure of the water when the inclosed space around the wreck has been pumped dry. The stability will be further increased by the fact that the piling will be driven through ten to eighteen feet of mud and some thirteen feet through the softer clay. As each length of sheet piling will be driven "to refusal," that is to say, until the steam hammer fails to make any further impression, it is believed that the cofferdam wall will prove to be watertight, and that the seepage below the bottom of the dam will be practically negligible.

From what has been said above, it will be understood that the engineers are not depending upon the strength of the cofferdam, considered as a vertical arch, to resist the water pressure. In fact, the circular sheet-piling walls, filled with plastic clay, would have no ability whatever to resist the horizontal crushing pressures induced by arch action. No dependence is being placed upon the arched form of the wall, nor will it be necessary, since it will have sufficient thickness and weight, as explained above, to give it inherent stability. When the cofferdam has been completed, centrifugal pumps will be employed to remove the water, and it is probable that a large portion of the mud can be removed by the same method.

A plan under consideration is to use the rock from an old tunnel dump for back-filling along the interior face of the cofferdam at its foot, and then, by means of drag buckets, to scrape the mud away from the hull toward the cofferdam wall. It is estimated by Col. William M. Black, of the Engineer Corps of the army, who has charge of the work, that the unwatering and exposure of the hull will cost $225,000 out of the $300,000 appropriated. When this point has been reached, which he estimates will be in about three or four months time, operations having already commenced, it will be for Congress to determine what disposition is to be made of the wrecked ship.

The New Edison Cell.

The new type of Edison nickel-iron cell recently placed on the market differs from the old form in several details. The electrolyte, although still a solution of potassium hydrate, contains a little lithium hydrate, which apparently improves the working of the positives. The iron element has the greater capacity of the two, but is much the same in character as formerly. The positives used to be made up of nickel oxide and graphite, in flat rectangular pockets; but the graphite oxidized and forced out the pockets. Round tubes, 4 inches long and about the diameter of an ordinary pencil, are now used to retain the nickel oxide. The tubes are of steel, bound with eight steel rings. Also, in place of graphite, electro-chemically prepared flakes of pure nickel are used to increase the conductivity of the active material. Each positive holds 30 of these tubes. The negative plate comprises 24 flat rectangular pockets in a nickel-plated grid. The following data are given,

	Type A-4.	Type A-5.
Rated output (amp.-hours)	150	225
Average discharge voltage per cell	1.2	1.2
Normal rates of charge and discharge, amps.	30	45
Weight, cell complete, lbs.	13.5	19.2
Width of can, inches	2 9/16	3¾
Breadth of can, inches	5	5
Height of cell to top of pole, inches.	13⅜	13⅜
Required height of battery compartment, inches	15	15

Self-forming continues for some time. The efficiency is 60 to 65 per cent, and the watt-hours per pound of cell are for the smaller type 14, and for the larger 16.

The Current Supplement.

The current SUPPLEMENT, No. 1825, contains among other noteworthy articles, some comments by Sir Oliver Lodge on electricity and agriculture, a discussion of the oil engine in marine work, and a description of the manufacture of electric-lamp filaments, by Dr. H. F. Baumhauer.—A practical apparatus for the sterilization of water by ultra-violet rays is contributed by the Paris correspondent of the SCIENTIFIC AMERICAN.—Various methods of electro-plating metals are described and illustrated.—Recent investigations on the part of certain physiologists and histologists tend to throw some new light on perhaps the greatest of all scientific and philosophical questions—the problem of life and death. These researches are briefly reviewed by Mr. T. Wood Clarke under the title "The Problem of Elemental Life."—Mr. William R. Reinick has been investigating the subject of insects that destroy books for many years. His story is by far the most exhaustive that we have seen. It is published in the current SUPPLEMENT.—Dr. Charles L. Dana writes on modern views of heredity from the Mendelian standpoint.—Our aviation readers will be more particularly interested in a very thorough article on the methods of measuring the heights of aeroplanes. —Dr. Charles P. Steinmetz concludes his paper on the physiology of light, one of the most valuable on that subject which has ever appeared in the SUPPLEMENT.—Under the heading "Discipline and Efficiency," Mr. Harrington Emerson, to whom Mr. Brandeis owes much of his information regarding the inefficiency of railroad management, shows how essential discipline is in shop management.

A Growing Southern Industry.

The value of the annual granite output of Georgia, North Carolina, Maryland, Virginia, and South Carolina is now about $3,500,000, the States being here named as they ranked in value of production in 1908. Of course the annual granite output of these Southern States falls far below that of the New England States, which is valued at about $9,000,000, but the granite industry is fairly well established in the South and gives promise of steady growth.

Correspondence.

THE MIRROR PROBLEM.

To the Editor of the SCIENTIFIC AMERICAN:

An old but none the less interesting and instructive problem asks: "Why does a mirror reverse right and left, but not up and down?" Suppose, for instance, the word HAT were printed vertically, thus: H A T and held before a mirror, the image would be like the original and could be read quite as easily; but the H of the image would be at the top like in the original. But if it were printed horizontally, like in a book, thus: HAT, the mirror would reverse it and give it back as TAH. Hence a sign or book held up against a mirror cannot be read, because the words are all reversed, though the top and bottom of the book are not. The problem is to explain this anomaly. It is well to caution one not to work at it more than an hour a day, as it may drive some people to near insanity.

While this problem may be old, perhaps the following curious version of it may be new to some: When one corner of a room consists of two mirrors at right angles to each other, as is sometimes the case in restaurants or public halls, then the image seen in that corner is *not* reversed, either right and left or up and down; a book held up in front of that corner can be read quite as easily as the original. If you offer to shake hands with your image in this corner, he will be as polite to you as you are to him, and will extend his right hand to you if you do so to him; while in the plane mirror the image will follow the golden rule when you offer him your left hand, but not when you offer the right one.

Another curious feature which may be new to some, which is seen in this mirror corner, is that no matter what part of the room you are in, you can always see your image in this corner. If you run around in the room, you see your image always remaining in the corner. In this way a moving body might be photographed as though stationary, on an opaque film, without right and left reversals. Possibly two such photographs of a moving object might, if skilfully taken, give curious effects when subsequently combined in a stereoscope.

In the absence of such a mirrored room, the results can be obtained in a small way by means of a small frameless mirror or piece of mirror glass held perpendicularly against another mirror. They should, however, fit closely, and it is essential that they be held exactly at right angles to each other.

Philadelphia, Pa. CARL HERRING.

THE OLD BALLOON IN CANADA.

To the Editor of the SCIENTIFIC AMERICAN:

I note in your issue of November 26th inquiry from O. H. Ingram, of Eau Claire, Wis., concerning the aviators of a balloon that landed in the Canadian wilderness north of Ottawa some time in the fifties. He locates the time about 1854 or 1855, and the place near the headwaters of the Gatenau River. He thinks the balloon came from St. Louis, recalls the name of the balloonist as Le Fontaine, has forgotten the name of the balloonist's companion, is sure that they had a hard time before they got out of the wilderness, and says they were rescued by a small party in the employ of Gilmore & Co., lumbermen.

Mr. Ingram is evidently mistaken as to the time; but there is no chance for mistake as to the identity of the balloon party. They were La Mountain, a professional aeronaut, and John A. Haddock, editor of the Watertown Reformer, which was then the leading paper of Jefferson County, New York. They went up from Watertown in the late afternoon of September 22nd, 1859, and they found themselves the next morning in an utter wilderness, which they finally made out to be about the headwaters of the Gatenau River, 180 miles north of Ottawa. They were without supplies, and they tried to follow a stream out. They were near the perishing point when they came upon a party of lumber prospectors of Gilmore & Co., the head of the party being Angus Cameron. They had been nine days missing, and had been given up for lost when they finally reached the telegraph at Ottawa. The way that St. Louis comes into the story is this: The balloon, which was known as the "Atlantic," had made in the preceding August a highly successful voyage from St. Louis to Jefferson County, New York, carrying La Mountain, Wise, Hyde, and Gaeger, but being much wrecked by a big tree when landing. La Mountain, however, recovered, cut down, and repaired the balloon, and with the local editor as a companion started as noted on a further voyage from Watertown.

The whole story is told very entertainingly by Mr. Haddock in his "History of Jefferson County, New York," pages 350 et seq., published in 1895 by Weed-Parsons Company of Albany. W. O. PAYNE,
Editor Nevada (Iowa) Representative.
Nevada, Iowa.

HOW ALTITUDE RECORDS ARE MADE.

Dynamic flight has leaped forward in many gigantic jumps this year, but its soarings upward have been even more remarkable. The last three months have witnessed the making of three wonderful altitude records—two in our own country and one in France.

Ralph Johnstone, America's premier aviator, was the first to break the world's altitude record this fall—the record of 9,186 feet (subsequently reduced to 9,102) which had been held for but a short time by Henry Wynmalen. He accomplished this great feat in a special Wright biplane on Monday, October 31st, the last day of the international aviation meet. Simultaneously Mr. J. Armstrong Drexel, the wealthy amateur aviator, who last summer made a record of 6,600 feet, reached 8,373 feet in his Blériot monoplane. Johnstone was only 35 minutes reaching nearly 8,000 feet, but it took him about an hour to climb the last 1,000. He descended at a terrific rate in one long dive that lasted five or six minutes. From a speck in the sky his machine could be seen growing larger rapidly, until it finally alighted safely upon the field. He had kept his motor throttled while descending, and so did not have such a terrifying experience as did Brookins when, earlier in the meet, he descended 5,000 feet in the baby biplane with the motor "dead" and damaged the machine considerably upon alighting. While Johnstone did not experience any particularly disagreeable sensations, Mr. Drexel upon this occasion was attacked by air sickness when at his highest point and out over the Atlantic Ocean. He immediately brought his monoplane about and descended in wide circles as rapidly as possible. Besides the feeling of sickness that came over him, he was also numb with the cold. Johnstone had beaten him, but he had not made his final altitude flight. On November 17th the daring biplanist lost his life at Denver as the result, apparently, of too steep a dive.

Legagneux making a cross-country flight in France.

The descent was made in a straight line at an angle which brought him to earth 12 to 15 miles away. In attempting to fly back the next day, he followed the wrong river and went as far north as Trenton, N. J., passing over the city. After alighting the second time, he shipped his monoplane home by rail.

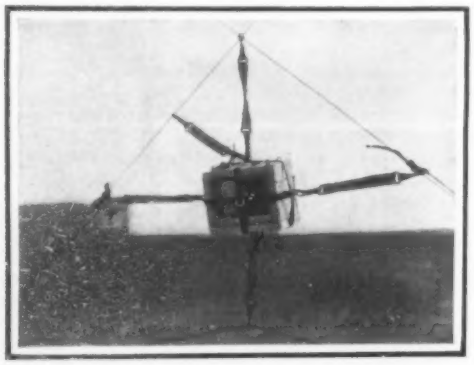
After several tests and verifications, and after the proper corrections had been made, it was found that the height registered by the barograph (9,929 feet) was in reality 9,897, so that the monoplane had again beaten the biplane, this time by 183 feet. Owing to the making of a new rule that in order to constitute a record the superseding height must be 100 meters (328 feet) greater than that previously attained, Mr. Drexel's record at Philadelphia did not count officially. Nevertheless it was a wonderful record to have been made so late in the year, when the cold at 10,000 feet elevation is considerable.

Mr. Drexel's amateur height record was broken two weeks later (on December 9th) by Legagneux, one of the leading French long-distance fliers, who, according to the first reports, reached a height of 3,200 meters (10,499 feet) on a Blériot monoplane. Legagneux first sprang into prominence in the 'Circuit de l'Est" last summer. He completed this great trip around France in a Farman biplane, and he has used this machine successfully of late in his 180-mile flight from Paris to Brussels with a passenger. He covered the distance in 3 hours 28 minutes and 34 seconds, including a half hour stop for supplies. His average speed was therefore about 60 miles an hour, which is remarkable in view of the load carried, and which was undoubtedly due to a high and favorable wind. One of our illustrations shows Legagneux making a cross-country flight in his Farman machine, while another shows him in a biplane of his own design, in which he has also flown.

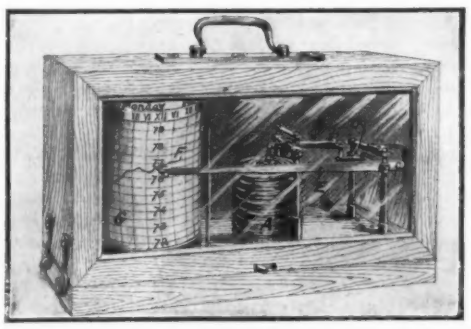
The various methods of determining the height of an aeroplane are described in detail in the current issue of the Scientific American Supplement by Commandant Renard of the French army, who is an expert on these matters. M. Renard concludes that the registering barometer, or barograph, is the best instrument for accurately determining altitude, but that it is apt, if anything, to indicate lower than the height actually attained. As a rule a number of corrections must be made of the record, The chief of these is the correction for temperature of the air, as can be seen from the appended description of the Drexel barograph and the manner in which it was checked. The instruments that were used at Belmont Park were carefully calibrated in advance by Major Samuel Reber, U.S.A., who served on the contest committee of the Aero Club of America. Laplace's formula was made use of in this work, and as the corrections for temperature were allowed for, the record as obtained on the chart was practically correct. Each instrument was calibrated separately, the readings being checked at every 50 millimeters upon the chart. So accurate were the results thus obtained that two barographs sent aloft on the same aeroplane varied from each other only 13 feet, or less than the width of the recording line, which was equivalent to 17 feet.

The Richard barograph used by Mr. Drexel in his record flight of November 23rd to record the altitude

(*Concluded on page 508.*)



A barograph in place in an aeroplane, showing method of suspending by straps.

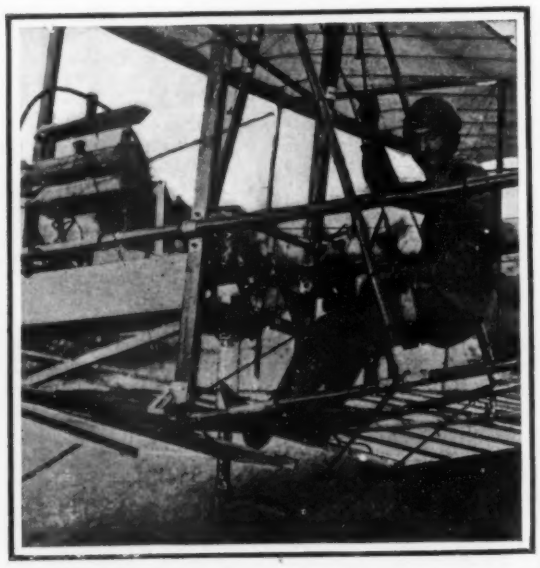


Details of barograph used for recording altitude.

Nothing daunted, Drexel, only six days later, made a successful attack upon Johnstone's height record at Philadelphia. This time he ascended in spirals as usual, and when he could not seem to go higher, he would make a sudden dive and then shoot upward like a roller coaster, in an effort to gain a few feet.

J. Armstrong Drexel, America's champion amateur aviator, about to start a flight in his Blériot monoplane.

The late Ralph Johnstone.
Up to the time of his death a month ago, Johnstone was the world's most daring and skillful aviator, and holder of the altitude record.



Legagneux in a novel biplane of his own construction. He is the present holder of the altitude record with 10,499 feet.

AVIATORS WHO HAVE MADE NEW AEROPLANE ALTITUDE RECORDS, AND THE BAROGRAPHS WITH WHICH THESE ARE RECORDED.

THE FIRST MAN-CARRYING KITES IN AMERICA.

Man carrying by kites was demonstrated for the first time in America as an attraction at the Boston-Harvard aviation meet last September. There it was shown by Samuel F. Perkins, as it also had been shown by Capt. Cody in England, how easily a man could be sent 200 feet in the air supported by from six to fifteen enormous 18-foot passenger-carrying kites. The height to which man can rise (up to 1,000 feet) by this method varies according to the wind velocity.

The army officers present at the Boston-Harvard meet testified to the great value of the man-carrying kite for scouting purposes in time of war. Such a kite is at its best when the winds are so strong that aviators dare not venture out with their aeroplanes.

While giving a demonstration at St. Louis recently, Mr. Perkins had a fall of 75 feet by the breaking of a rope connecting his several kites; but, owing to his wide experience in ballooning, he managed to break his fall, and was not severely injured.

KITE EXPERT PERKINS IN MID AIR SUSPENDED FROM A STRING OF SPECIAL LIFTING KITES.

Lands Yet Unknown.

It is a mistake to assume that most of the earth's surface has been explored. Indeed, there remains much for the explorers to accomplish.

In Africa there are the Sahara, Wadai, and the valley of the Sobat. In the Sahara the highlands of Tibesti and those of Ahaggar need exploration.

Wadai has been visited by only a very few persons; and although it would be very difficult to penetrate into the territory itself, it is thought that useful exploring work might be done in some of the outlying districts, approachable from the upper Benue or the Ubangi Welle.

The region between Lake Rudolf and Abyssinia, and the valley of the Sobat, a tributary of the White Nile, are believed to be of great interest, but are almost unknown.

Aside from these three regions, it may be said that there is a fair knowledge of the general geographical features of Africa, but much detail remains to be ascertained, and much indifferent work must be done again. It thus appears that Africa still offers a wide and interesting field of research to the explorer.

In Asia there are unexplored districts in various directions. Despite recent journeys in Oman and in the Hadramaut, there is still an unknown region in Arabia upward of four hundred miles square; and there is also much yet to be done in Asia Minor.

In Persia parts of Luristan and the country of the Persian Kurd still remain unexplored. Farther east Sven Hedin and others, extensive as their travels have been, have left a great deal of work for the future explorer. There are passes from Tibet into Nepal, much unknown country in southwestern Tibet, the mighty range that bounds the Tsanpu valley on the north, and extensive tracts of the northern plateau, all awaiting the scientific explorer.

The great river Tsanpu, from longitude ninety-four degrees and ten seconds east to its entrance into the valley of Assam, under the name of Dihong, is practically unknown.

The region embracing the complicated mountain and river systems between India and China also affords opportunities for the adventurous explorer, inasmuch as there is much to learn about it.

In the mass of islands lying to the south of Asia, there is a great field for exploration, especially in New Guinea. Some of the larger islands to the east of New Guinea are also virgin ground.

In North America most of the work of the explorer has been done, yet in the Dominion of Canada vast unknown tracts invite the explorer.

It is in South America, however, that the most extensive unexplored regions await the visits of scientific travelers. Although this continent is far richer than that of Africa, and although it has attracted the ablest explorers, it has on the whole received much less attention than Africa; why, it would be difficult to say.

Many parts of the Colombian cordilleras still need exploration, as well as the basins of several northern affluents of the Amazon; while to the eastward there is an enormous tract that is still practically unknown. This is that wild, forest-covered region that was the scene of the adventurous searches for El Dorado in the sixteenth century. Farther south, although the region to the eastward of Cuzco, the ancient capital of the Incas, is now attracting attention, much is yet to be done.

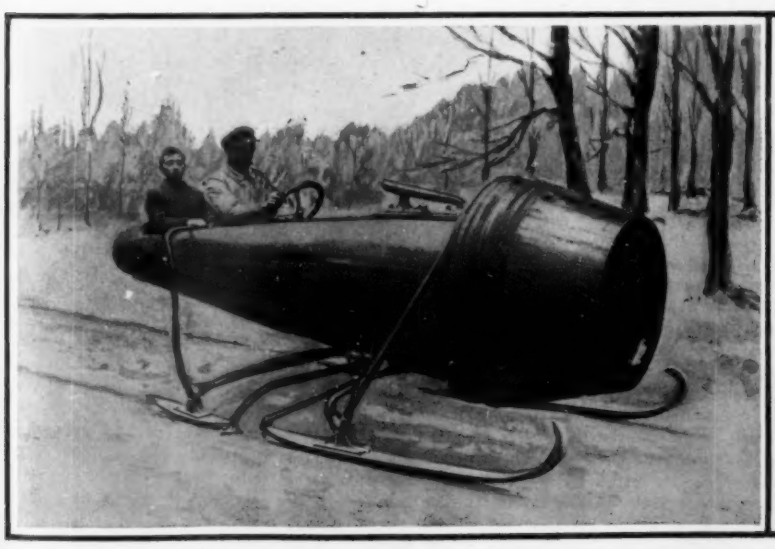
Of great interest are many unknown parts of the Andes of Peru, especially the little-known district round the lake of Parinacochas. The mountain peaks of the range above Tarapaca are virgin, and those of Sajama and Pallahuari have not yet been adequately measured. Indeed, it may be said that the whole orography of western South America is a most tempting field of research for the explorer of the future.

A NOVEL AIR-PROPELLED MOTOR SLEIGH.

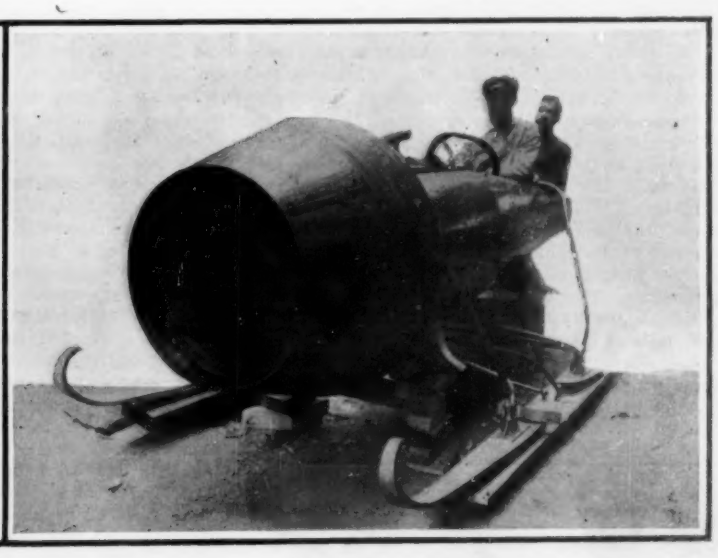
The motor sleigh shown in the accompanying illustrations is constructed on altogether original lines. In appearance it resembles somewhat the hull of a fast hydroplane boat. It consists of a semi-torpedo-shaped body mounted upon two pairs of runners, and carrying in front a multiple-bladed air propeller or fan, inclosed in a conical housing. The inclosing of an air propeller in this way is a fallacy, as instead of increasing the efficiency of the propeller it diminishes this perceptibly. In like manner, the use of a large number of blades in a propeller is not nearly so good as the use of but two. Therefore, while the housed propeller used on this Russian motor sleigh looks well to the uninitiated, it cannot give the results that an open two-bladed propeller rigged above the machine would give. For this reason a powerful 4-cylinder, water-cooled motor of 40 horsepower or more is used, whereas an air-cooled motor of half this power ought to suffice. The machine is claimed to have a speed of 45 miles an hour. The small runners at the rear are connected together, and arranged so they can be turned about a pivot at the center of the connecting rod by means of the steering wheel. The other rods that run up upon either side, and are held by the second man, enable him to assist in steering. The cross-rod with a flat spade-like end (seen in front of the rear runners) is used as a brake. When not in operation, it can be turned up out of the way.

To Our Subscribers.

We are at the close of another year—the sixty-sixth of the SCIENTIFIC AMERICAN'S life. Since the subscription of many a subscriber expires, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any interruption in the receipt of the paper, subscriptions should be renewed before the publication of the first issue of the new year. To those who are not familiar with the SUPPLEMENT, a word may not be out of place. The SUPPLEMENT contains articles too long for insertion in the SCIENTIFIC AMERICAN, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the SCIENTIFIC AMERICAN and SUPPLEMENT the subscriber receives the benefit of a reduction in the subscription price.



Side view of motor sleigh, showing small steering runners behind.
The top of the motor is visible just back of the circular hood.



Front view of sleigh, showing multiple-bladed propeller at the rear of hood.

RUSSIAN MOTOR SLEIGH OF GRAND DUKE CYRIL AND PERKIN'S MAN-LIFTING KITES.

THE COOPER HEWITT LIGHT-TRANSFORMING REFLECTOR

BY JOSEPH B. BAKER

The analysis of ordinary daylight given by its spectrum shows that it consists of a commingling of all visible wave lengths of light, from the longest waves at the red end of the spectrum to the shortest waves at the violet end.*

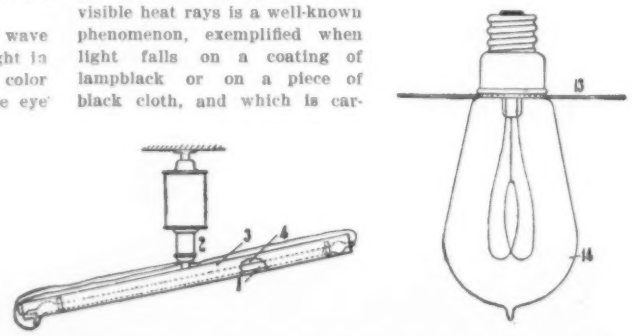
The spectrum shows the distribution of these wave lengths and the amount and the intensity of light in each. Colored bodies give the impression of color on account of the property of reflecting to the eye certain wave lengths and absorbing others. If the light illuminating the object is intense in the particular color reflected by the body, then the body will appear very brilliant, but if the light is deficient or weak in the wave length representing this particular color, the color of the body will be weak or not visible (there being little or no light that it can reflect to the eye) and the body will appear dull or black.

There are a number of artificial lights which are brilliant and economical, but lacking in "quality," or color values for certain purposes for which they may be used, and also as compared with daylight. Whether the means of producing these lights is oil, gas, or electricity, one and all are at a disadvantage in that their spectra differ in range and distribution of wave lengths from the solar spectrum, so that fabrics have a different color when viewed by each of them; and some are more or less unpleasing to the eye, or unsuitable to work by, especially in occupations requiring close application of the eyesight.

From time immemorial attempts have been made to "soften" the light coming from artificial sources—as, indeed, daylight also—by the use of colored shades, which cut down the intensity of light in certain portions of the spectrum. But these attempts result in inefficiency, for the reason that a light-transmitting shade cannot color the light which shines through it, but can only transmit certain of the wave lengths already in the light, suppressing the others. Thus a red-tinted glass shade surrounding a powerful light source rich in green rays will temper the disagreeable glare, but will also enormously cut down the total amount of light from the lamp, by straining out nearly all wave lengths except those in the narrow range in the red and the blue regions of the spectrum; the shade not being able to put into the emitted light what is not there already. It would be desirable, but it has hitherto been impossible, to apply a shade or a reflector to a light source which will have the effect of introducing into the light emitted by the lamp the rays in which the light source itself is deficient. A shade or reflector which would accomplish this result would become an important auxiliary to that light source, co-operating with the latter to give a satisfactory illumination from the lamp as a whole.

This result has been accomplished, it is claimed, in the new light-transforming reflector recently patented by Dr. Peter Cooper Hewitt, the well-known inventor of the mercury-vapor lamp. By utilizing the phenomenon of fluorescence Dr. Hewitt has succeeded in transforming the radiation of a light source which is powerful, but is considered deficient or of impoverished and ill-balanced spectrum, into radiation of a wholly different range of wave lengths, which eke out, so to speak, the distribution of wave lengths emitted by the source; the radiant energy being transformed or converted by the molecular mechanism of fluorescent material formed into a reflector for the primary light source. The fluorescence of the material being excited by the light from the source, the material emits its own particular colors, or wave lengths of light due to its fluorescence, which wave lengths, mixed with the original light, supplement the deficiencies of the last.

In order to understand the *modus operandi* of this invention, it is necessary to define true fluorescence, as distinguished from the mere transformation of light into heat. The conversion of light rays of all the visible wave lengths into invisible heat rays is a well-known phenomenon, exemplified when light falls on a coating of lampblack or on a piece of black cloth, and which is carried to the theoretical limit in the "blackbody" of the physics textbooks. But when the light falls on a fluorescent body, inasmuch as the radiations from this body are in the visible region, for the purposes of this description the body may be said to be fluorescent.



Application of light-transforming reflector to Cooper Hewitt tube and incandescent lamp.

DR. PETER COOPER HEWITT.

This photograph was made by the Cooper-Hewitt light.

The transformation of radiant energy into invisible radiations, or heat, is of no use for illumination purposes. But fluorescence, which is the action of certain optically active substances, in receiving radiations of a given range of wave lengths and transforming them into another set of wave lengths that are visible, is useful for illumination; and it is this property which Dr. Hewitt has conceived of as a means for transforming light from one color into another, and which he has utilized for this purpose in his light-transforming reflector. This light transformer, described in a recent British patent,* consists of a reflecting surface, such as kalsomine, giving light scattering or diffused reflection (as distinguished from the image reflection given by a polished glass or metal surface), coated with a layer of translucent material containing a fluorescent substance. This reflector is placed back of the primary light source—which may be, for example, a Welsbach incandescent gas mantle, a carbon or tungsten filament electric lamp, or a Cooper Hewitt tube—so that the radiation from the primary source impinges upon the reflector, and is by the latter given back in transformed condition. A considerable amount of the energy of the emitted waves is transformed, in passing through the fluorescent substance to the light-scattering reflecting surface, into a set of waves of a range lower down in the spectrum band—that is, in the red and orange region of the same—and in passing out again from this surface through the fluorescent substance, an additional amount of the energy is thus transformed. The total action of the reflector is therefore to transform a considerable portion of the original emitted energy from the light source into red or orange light. The reflector does not interfere with the rays coming directly from the light source, but the illumination as a whole, coming from the light source and the reflector, is made to possess a spectrum of far better distribution than that possessed by the light source alone or by the same equipped with an ordinary non-fluorescent shade or reflector, and the illumination from a Cooper Hewitt lamp may be made to compare favorably with daylight.

A striking example of this general achievement of Dr. Hewitt is the application of the light-transforming reflector to his own lamp. It is well known that this lamp emits a greenish light which is almost wholly lacking in red rays, and which is therefore not adapted for general illumination, although admirable for certain special uses, such as photography and photo-engraving, on account of the richness of the light in blue and in violet, and for drawing offices, machine shops, and certain other work rooms. The spectrum of the Cooper-Hewitt light embraces, roughly, the upper half of the solar spectrum, although with markedly different allotment of bands and lines which result in a preponderance of green, so that many objects illuminated by the tube show certain colors as different from those familiar to their daylight aspect. Certain shades of blue become purple, and human faces look either very dark or ghastly pale, according to the amount of ruddy "color" in the complexion. Such are the nature and the limitations of the Cooper-Hewitt light, which have barred it from general utilization as a social illuminant, notwithstanding its high electrical efficiency, simplicity, and economy.

Now place behind the mercury tube a concave, trough-like fluorescent reflector, consisting of a white reflecting surface coated with a translucent film impregnated with "rhodomine B." The illumination is transformed, as by magic, to a close approximation to daylight, and objects and fabrics, such as wood and metal articles, colored chemical solutions, silk ribbons, woolen rugs and hangings, resume their normal or familiar colors, and the faces of friends clear to the "natural hue of health." In the laboratory of Dr. Hewitt, in the Madison Square Tower, New York city, the artificial daylight given by tubes equipped with his light transformer shows the natural colors of a card of silk samples at night as perfectly as the broad daylight coming in at a large north window when its shade is raised. No less striking is the appearance of the reflector and tube themselves, when viewed directly; the value of the reflector being evinced by the large proportion of the total light which it is observed to emit. The ocular impression of the fluorescent reflector itself as a true secondary light source, by reason of its activity as a genuine transformer of radiant energy, is strong.

The results to be expected are little short of revolutionary in the art of illumination, since by the use of the fluorescent reflector light sources which are not now commercially practicable may be brought into satisfactory utilization with no alteration of the lamp mechanism or mounting other than the attachment of the reflector, and no change in the electrical or other supply. It is conceivable that the cost of special color lighting may in future be materially reduced by employing primary light sources of high radiation efficiency but ill-balanced spectra, and then equipping them with light-transforming reflectors.

* By "daylight" is meant the best state of solar illumination, the most acceptable stage of the widely varying light of the sun between dawn and dusk and through all conditions of clearness of the atmosphere. It is, however, more than an open question whether daylight is the best illumination for certain classes of work, although it may be always the standard for color values. It is recognized by all women that daylight is by no means the most becoming light—candle light, and the light from a wood fire, which are much richer in red and orange rays, being preferred.

* No. 8,449, dated July 28th, 1910.

THE INVENTOR'S DEPARTMENT

SIMPLE PATENT LAW; PATENT OFFICE NEWS; INVENTIONS NEW AND INTERESTING

The Editor will pay for short articles available for this department

SOLUTIONS OF MR. M'NEILL'S PERPETUAL MOTION PROBLEM.

VARIOUS METHODS AT ARRIVING AT THE SAME ANSWER.

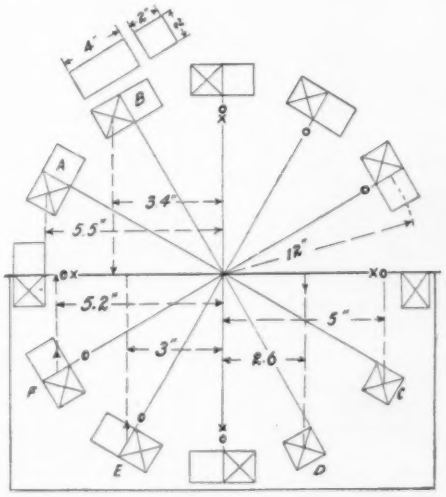
Out of a multitude of answers to Mr. M'Neill's perpetual motion puzzle, which appeared in our issue of November 26th, we have selected the following for publication in these columns, as representative of the various methods of attacking the problem. Many answers which are just as correct as these given here have been omitted for the reason that they do not seem to be quite as simple or quite as well expressed as the ones here selected. We are pleased to note that the majority of our readers found the key to the situation, which lies in the fact that while the box is telescoping, it is for that period of time relieving the belt of a certain amount of pull.

To the Editor of the SCIENTIFIC AMERICAN:

In the perpetual motion problem presented by Mr. Dennis M'Neill and published in the issue of November 26th, I would like to make a few changes which will not influence the principle of the paradox, but which will render the problem less complicated.

The length of the belt carrying the weights may be reduced to zero without affecting the balance, so let the buckets be fastened directly to the wheel.

The use of the spring is open to the objection that its force is not constant at different lengths, and I have substituted compressed air in its stead. All the



buckets shall be connected to a common reservoir at the center of the wheel.

Instead of having the vacuum to hold the weights in place, we will suppose a trigger to lock the weight in place at the extreme right position, and be released at the bottom.

This will require little or no energy.

I have restricted the sizes and weights to the following: The wheel shall have a 12-inch radius to the center of the buckets. The buckets shall be $2 \times 2 \times 2$ inches, and the weights, which shall weigh 3 pounds, shall fit the buckets snugly. A solid piece of lead would just about fit. The liquid in which the wheel is half immersed shall weigh one ounce per cubic inch.

The pressure on the face of the lowest weight will be $12 \times 2 \times 2 = 48$ ounces $= 3$ pounds. Then the air pressure on the inside must be 12 ounces per square inch to balance this force.

When a weight gets in the extreme right position, its weight being 3 pounds will balance the air pressure within and will close, while the air goes into the lowest bucket and pushes out the weight. Hence there is always a perfect balance. Now the question as to whether the machine will work or not is the same as that in Mr. McNeill's problem.

The forces tending to revolve the wheel are effective in proportion to their value multiplied by their distance from the vertical line passing through the center (since all the forces are vertical).

On the spokes where I have placed an o the turning moment due to the weights is neutralized by the weight on the spoke exactly opposite, since the weights are equal and equidistant from the vertical axis. The effect of the buoyancy of the liquid is neutralized at the horizontal and vertical axes as indicated by the x's.

Now the effective moments tending to turn the wheel in an anti-clockwise direction are the weights at A and B. The total moment is equal to $48\ (5.5 + 3.4) = 427.2$ ounce inches.

The buoyant effect on C and D is equal to the displacement $= 8$ ounces. Then the effective weight is 40 ounces, and the total moment of C and D clockwise $= 40\ (5 + 2.6) = 304$ ounce inches. Added to this is the buoyant effect on E and $F = 16\ (5.2 + 3) = 131.2$ ounce inches.

$304 + 131.2 = 435.2 \qquad 435.2 - 427.2 = 8$

8 ounce inches in favor of clockwise rotation from the inaccurate results of scaling the sketch. Therefore it is evident that the moments are balanced, and there will be no rotation.

HOWARD B. COOK.

To the Editor of the SCIENTIFIC AMERICAN:

There is one feature with regard to which all perpetual motion machines are alike; they are all intended to derive energy from the surroundings. Not even the most simple-minded and hopeful enthusiast of the scheme of perpetual motion expects to create energy. His aim is to design a machine which will be able to draw from its surroundings without returning an equivalent. Consequently, if the machine before us does actually possess the ability to run forever, we should expect to find that the total work performed upon its moving parts by external bodies exceeds somewhat the total work performed by these moving parts upon the same external bodies. Let us see what analysis brings forth.

For convenience, suppose that A is the area of the bottom of one of the vessels, d is the distance traversed by the bottom in moving from the contracted to the extended position, h is the radius of the mid point of a vessel when the latter is held upon the rim of the lower wheel, and w is the weight of a cubic unit of the liquid, probably water, in which a part of the lower wheel is immersed. If now we confine our attention to a single vessel, it is evident that the result, found for it as it passes through a complete cycle, will be equally true of the entire mechanism. We choose as the initial point the position where the vessel is about to leave the rim of the upper wheel. The movable bottom of the vessel drops a distance d doing a certain amount of work, part being stored in the compressed spring, and part being transmitted to the moving belt and wheels. When the vessel reaches its lowest position, the spring expands against the hydrostatic pressure $w.\ h$, doing upon the liquid the work $(A.\ w.\ h)\ d$, which must be equal to that previously stored in the spring. Finally, as the vessel rises from this position, the liquid returns to it the energy $(A.\ d.\ w)\ h$ due to its buoyancy. It is evident that the other energy expressions involved in the cycle are balanced. In short, that is, the water, though it actually transmits energy to the vessel, transmits no more energy than the vessel previously gave to it. And we conclude that this mechanism is not capable of extracting energy from its surroundings. It fails at the point where all other perpetual motion devices have failed, and one is tempted to say, must always fail.

R. W. KING.

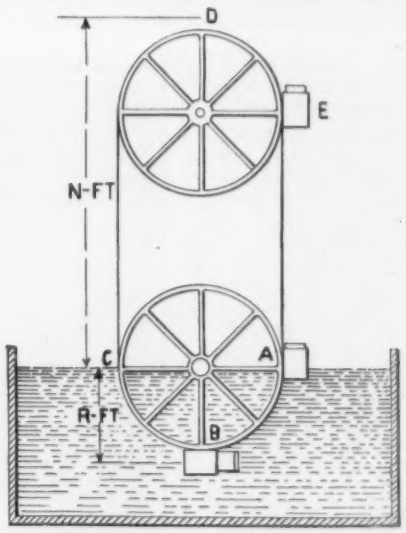
To the Editor of the SCIENTIFIC AMERICAN:

The reason the perpetual motion machine shown in your paper of November 26th does not work is, in my judgment, as follows: The energy supplied by the boxes toward turning the wheels while going down is not as great as the energy required to raise the boxes going up. This is due to the fact that the descending boxes while telescoping are using the force of gravity on the weights, not to turn the wheels, but only to overcome the resistance of the springs. In other words, each descending box fails to balance the corresponding ascending box for the equivalent distance of its collapse. The greater buoyancy of the ascending boxes while under water would not exert enough force to overcome this retarding tendency.

R. H. VAN SCHAACK, JR.

To the Editor of the SCIENTIFIC AMERICAN:

As Mr. M'Neill suggested, suppose the weights to weigh 4 pounds each. When immersed at A, we will suppose the weight decreases to 1 pound in the water displaced by the closed box, and expands to displace 3 pounds of water at B. Then the closed vessel in passing from A to B will generate 1 R foot pounds of work going clockwise, and in passing from B to C in its expanded condition it will develop 2 R foot pounds of work, due to the increase in buoyancy. The vessel in passing from C to D requires 4 N foot pounds of work. The weight of the vessel in passing from D to A develops 4 N foot pounds of work $- 3$ R foot pounds (3 R foot pounds is the work required to compress the spring, which work is expended at point



B in displacing 3 pounds of water at the depth R feet). Then in making one complete revolution clockwise we will have the following power generated and consumed:

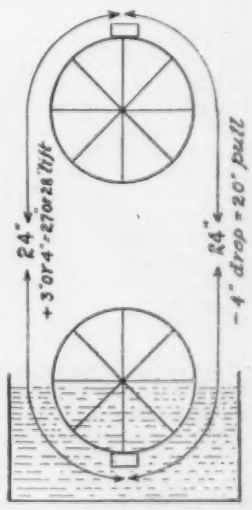
1 R foot pounds $+ 2$ R foot pounds $- 4$ N foot pounds $+ 4$ N foot pounds $- 3$ R foot pounds, which equal zero. If the power generated by one vessel in making one complete revolution is zero, it is evident that no matter how many vessels are attached, the resultant would be the same.

The problem can be made general by substituting x for the weight of the vessels, and y for the weight of the water displaced at B when the vessels expand.

ARTHUR ROBISON.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to the accompanying drawing, suppose the distance on either side from bottom of submerged wheel to top of top wheel is 24 inches and there are but two weights. The weight now on top revolves, and when over far enough to let the air out, will drop, say, 4 inches without any effect of its weight on the wheel; that is, this weight will come down 4 inches while the weight on opposite side has not advanced any.



On the other side, the weight at bottom must rise enough to drop out nearly of its own weight, which means the first 3 or 4 inches of its upward journey will be repeated. The answer on each side will nearly be as follows: Right side: $24 - 4$ drop of weight $= 20$ inches the weight will pull. Left side: $24 + 3$ or $4 = 27$ or 28 inches the weight must be lifted.

Therefore the top weight will reach bottom when the lower weight will be about 7 or 8 inches from the top of the top wheel on the left side. What will help it over? The surplus buoyancy of the air chambers in the water will just balance this defect.

C. C. SYVERSON.

Activity in dirigibles abroad is by no means slackening. The new Parseval "P. L. VII.," which is now in Russia, is 231 feet long, 42 feet diameter, and carries 16 persons. Its speed is about 24 miles an hour, and its motive power consists of two 6-cylinder, 110-horse-power N.A.G. motors.

light, and the light from a wood fire, which are much richer in red and orange rays, being preferred.

* No. 8,449, dated July 29th, 1910.

equipping them with light-transforming reflectors.

SOME QUEER POULTRY INVENTIONS

HUMOR RECORDED IN PATENTS

Among the many curious and freak inventions protected by the United States patent laws are a number which relate specifically to the poultry industry. The field itself might appear at first thought to be a fertile one; for while the great majority of poultry keepers are practical men and women, still there are very many who look upon the industry as a get-rich-quick scheme, and who without previous experience start in to reap a fortune and incidentally to revolutionize the business. These people, "the cranks," often evolve ideas which they are sure will accomplish both objects at once, if only patents can be obtained.

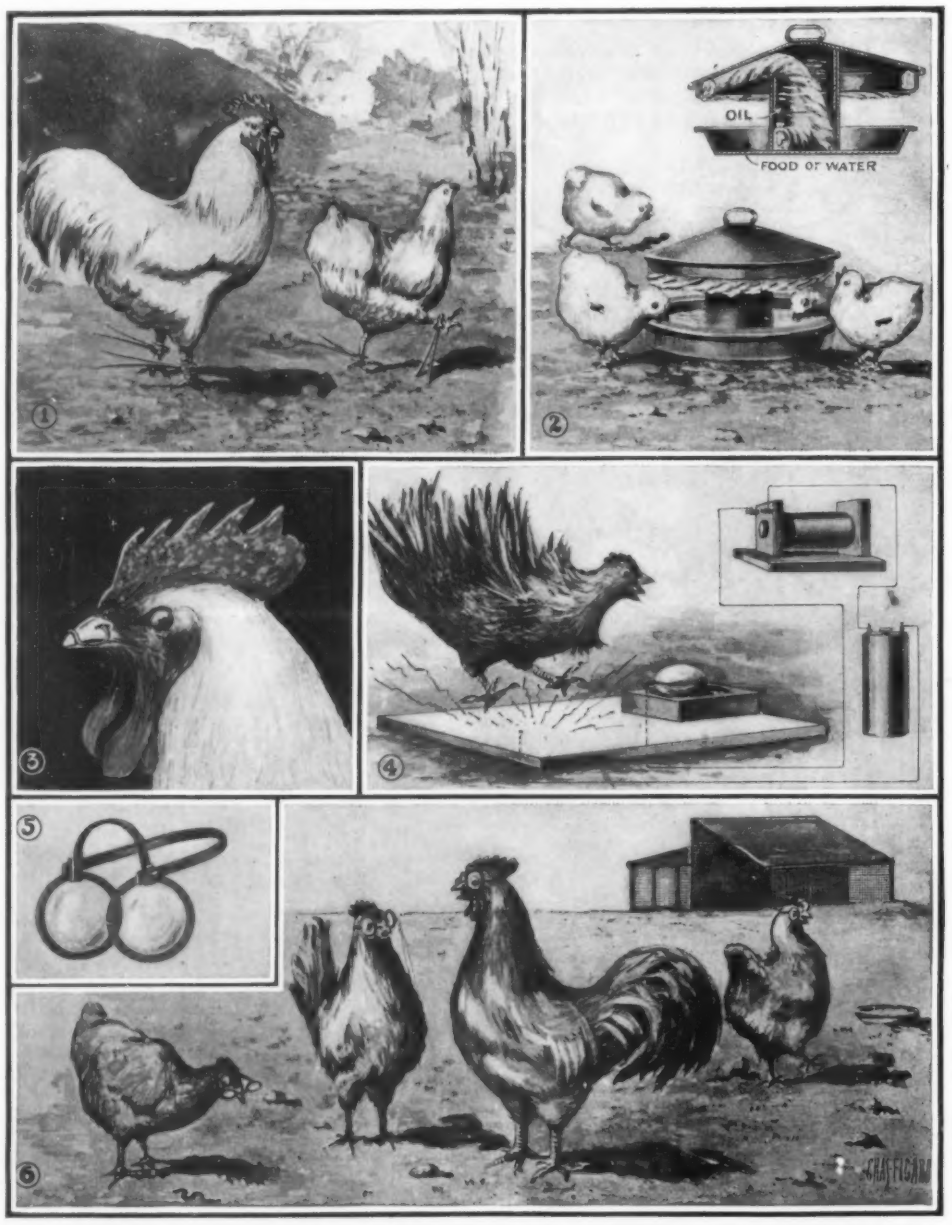
A Missouri inventor, Jeremiah Cory, of Holden, obtained in 1870 a patent on a device which showed in the patentee remarkable inventive genius, even though the patent itself was commercially unsuccessful. Cory evidently tried to keep both bees and poultry—a good combination. The bee moth, which works only at night, wrought havoc with his bees. Cory provided his hives with sliding doors, connected the doors with each other and with the hen roosts by means of a system of links and levers, added a counterbalance, and to prevent others from doing likewise without his consent, he patented the device. At night, after the bees were all in their hives, the hens would mount their roosts and thereby close the hive doors, locking the bees in and the moths out. In the morning, when the hens left their roosts, the doors of the hives were automatically opened, releasing the bees bright and early for their day's work.

A classic among curious inventions is the one granted to Sanford J. Baker, of Waterville, Me., in 1871. Baker's invention was a very ingenious device to prevent chickens from scratching. It consisted of a piece of spring wire, bent double, with a clamp at the bend. This was secured to the chicken's leg, leaving the two ends of the wire extending for some distance backward and slightly downward. Not only would this hinder the hen in scratching, but the spring arms would force her forward at each scratch, and if the hen persisted in the attempt, the device would compel her to walk out of the garden.

Special problems always receive much attention from inventors. The problem of keeping fowls free from insects has been solved to the individual satisfaction of a host of inventors, judging from the number of patents granted on such inventions. In general, the devices either aim to prevent the trouble, or their object is to cure it. Lack of space would not permit an exhaustive analysis of these patents, but the mention of a few may serve to illustrate the two kinds. J. M. Reid, of Pomeroy, Wash., aims to keep insects away from the fowls by means of small open cups of oil surrounding all supports in the hen house. On the other hand, W. W. Wilson, of Dallas, Texas, arranges a coil of lint so that it is always saturated with grease, and so positioned that the chick's neck rubs against the grease while feeding. Many inventors use oddly contrived dusting appliances, attached to the doors of the chicken houses, to watering troughs, or to food receptacles.

Another difficulty encountered in poultry raising is the vice of feather pulling, but thanks to C. C. Schild, of Ionia, Mich., a device, secured to the bill, will prevent the fowl obtaining a firm hold on the feather.

Several inventors have devised schemes to compel chickens to exercise. The old-fashioned method of making hens exercise is to scatter their food in straw, but the newer methods involve modified gymnasium apparatus, and are much more spectacular. Of course, the hens do not willingly take gymnasium exercise, but they can be compelled to do it while eating. The principle is the same in a score of inventions. William Jared Manley, of Erie, Pa., has a treadmill which may be adjusted according to the weight and agility of the fowl. By going fast enough, the bird eventually reaches the food, but must keep going in order to remain near the food. The inventor has failed to provide an attachment for utilizing the waste energy in pumping water.



1. Poultry fetter to prevent scratching. 2. Poultry greaser for use in protecting against insects. 3. Device for prevention of feather pulling in fowls. 4. An electrified metal plate prevents egg eating by hens. 5. Chicken spectacles. 6. Showing adjustment of spectacles or eye protectors to fowls.

SOME CURIOUS INVENTIONS RELATING TO THE POULTRY INDUSTRY.

Any number of nest eggs have been patented—at least a dozen whose double function is to deceive the hen and to keep the mites at a distance. Other eggs are medicated with nauseous mixtures, to cure the hens of the habit of egg eating. E. J. Shanahan, of Tribes Hill, N. Y., connects an egg with an electric battery, and places it in such a position that the hen, in order to get at the egg, must stand on a metal plate, which at once closes the circuit. One shock will either cure or electrocute the hen.

Charles A. Harp, of King, Texas, has obtained several patents on a chicken coop which is mounted on a lever like the old oaken bucket. The whole coop is lifted off the ground, and at the same time the door automatically closes. When the lever is locked in position the occupants are safe for the night.

But perhaps the most remarkable patent yet granted is the one to Andrew Jackson, Jr., of Munich, Tenn. Many of the blessings of humanity have been adapted and transferred to animals, but it took the junior Jackson to see the urgent need of spectacles for chickens. These spectacles are designed, not to cure astigmatism and near sight in the hen, but rather to protect the eyes in encounters with other chickens. As the patentee himself says: "This invention relates to eye protectors, and more particularly to eye protectors designed for fowls, so that they may be protected from other fowls that might attempt to peck them."

The Invention of the Raingage.

The invention of the raingage was formerly attributed to the Italian, Benedetto Castelli, who in a letter to Galileo, dated June 10th, 1639, records the measurement of the rainfall of a particular storm. This was, however, an isolated observation, suggested by an exceptionally heavy downpour, and did not lead to the general use of the method suggested.

In the first number of a new meteorological journal of the Far East, Scientific Memoirs of the Korean Meteorological Observatory (vol. I., Chemulpo, 1910), Dr. Y. Wada, director of the Korean meteorological service, calls attention to the fact that raingages were used in Korea nearly two centuries earlier than the date assigned to Castelli's invention. In the second volume of the "Historical Annals" we find the following statement:

"In the twenty-fourth year of the reign of King Sejo, the king caused to be constructed of bronze an instrument for measuring the rain. It is a vessel 1 *shaku*, 5 *sun* deep and 7 *sun* broad, set on a pillar. The instrument was placed at the observatory, and each time it rained the officials of the observatory measured the depth of the rain and made it known to the king. Similar instruments were likewise distributed to the provinces and the cantons, and the results of the observations were reported to the court."

The twenty-fourth year of King Sejo corresponds to the year 1442 of our calendar, i. e., 197 years before the date of Castelli's invention. Dr. Wada remarks that while the majority of the scientific instruments used in Korea in early times were of Chinese origin, he believes the raingage to have been a Korean invention. The introduction of the instrument undoubtedly arose from the great interest that the rainfall has for the people of a rice-growing country, especially at the period of transplanting in early summer.

In thus ascribing the invention of this important instrument to the Far East—which already had so many other inventions to its credit—Dr. Wada appears to have overlooked a note published by Dr. Hann in the Meteorologische Zeitschrift of April, 1895, quoting a memoir by L. Vogelstein, from which is appears that raingages are described in the Mishna as having been used in Palestine in the first century of the Christian era. Not only does the Mishna mention the use of these instruments, but the amount of rainfall during the "early rains" of autumn is given as about 21 inches, a value agreeing well with modern observations. These ancient measurements of rainfall in Palestine are the earliest known.

THE TRIALS OF AN INVENTOR.

BY WILL B. WILDER.

The "drivewell" controversies were fought back and forth in the courts for years, and presented issues as Judge Benedict said, "belonging to nearly every class known in patent litigation." The widespread use of this process of getting water from the earth involved numerous claimants and defendants in these legal contests, and a degree of bitterness was provoked not often aroused by impersonal questions. It was curiously appropriate that an invention worked out under the stormy circumstances surrounding this discovery should have a stormy career. The story of the inventor, Col. Green, would furnish a plot for a play.

In 1861 Green, who had been partly educated at West Point, was engaged at Cortland in organizing the 76th New York regiment to take part in the war for the Union. While the regiment was in camp at the Cortland Fair Grounds, reports came that some part of the Union army had been compelled to surrender for lack of water, and also that the Confederates were intending to poison the wells in places where the Union armies might come. Col. Green saw the military necessity for some kind of well that would be tight, to prevent the possibility of poison, and that could be constructed quickly, cheaply, and easily, so as to be available for a moving army. He conceived the idea of forming or driving a tube into the ground, without boring, and drawing the water from it with a pump. It is quite possible that he did not realize, at the time, the peculiar merits of the process.

Bored wells, fitted with a tube, had long been known and used, and Col. Green's object was probably to produce quickly the equivalent of a bored well. His process did much more, however. The driving of the tube into the ground packed the earth about it, so as to form an air-tight connection, and it was to this specific fact that the special virtues of the subsequently popular drivewell were due. The new device was tested at Col. Green's home and at his camp with distinct success; and he arranged for tubes to be taken with his regiment when it should move. He announced his intention of having the process patented, but, before he could take any such action, he became involved in a train of circumstances which for five years kept him absorbed, to the verge of insanity, in other matters.

Within a few days after perfecting his invention, he was compelled in the discharge of what seemed to him to be his duty to shoot one of the captains of his regiment, named McNett. The shot was not mortal, but inflicted serious injury. The local public, not accustomed to military discipline, and regarding Green and McNett merely as men and neighbors, became intensely excited and bitterly partisan. Green was suspended from his command, tried by a court of inquiry at Albany, and was reinstated in command. His regiment, after having required the protection of a battery to save it from mob violence, was moved to Washington; but there Green was relieved of his command and dismissed the service. He was, furthermore, harassed by civil suits brought to charge him with personal liability for articles used by his regiment. He was then arrested and indicted for the shooting of McNett, and after repeated postponements of the trial, effected because of the excited state of the public mind, was tried in 1866, and, the jury having disagreed, was discharged. During this period as a side issue, he became involved in church difficulties arising out of the shooting of McNett; was expelled from the church, and compelled to appeal to the bishop; and also become involved in litigation with the pastor of his church.

His efforts during this entire period to secure a reversal of the order dismissing him from the service were constant, and were attended with such anxiety of mind as to give rise to the charge that he was insane. He devoted his entire time to the controversy, and exhausted all his means, and, not unnaturally, forgot all about his invention. In the meantime, namely, in October, 1865, one Byron Mudge, who had conducted the early experiments under Green's directions, took out a patent on the process in his own name. An advertisement in the papers in the following month called Green's attention to the matter; and, against the advice of the lawyers who were then defending him in the matter of the shooting, and who wished to keep him out of further complications, he at once filed his application for a patent, and asserted his right to the invention. After a severe contest, the case of interference between Green and Mudge was decided in favor of Green, and a patent was granted to him in January, 1868.

Within a few years, one hundred and fifty patents had been issued for instruments to be used in the process of driving wells, and it was estimated that there were upward of a million driven wells in the United States. An English patent was taken out, and, after experimental tests by the best civil and military engineers of England, the process was adopted and successfully employed in supplying water to the British troops in the Abyssinian expedition.

The above facts are obtained from the report of Andrews versus Carman, 1 Federal Cases, 868. This was one of the infringement cases decided by Judge Benedict in the Circuit Court, Eastern District of New York, in 1876. It was reported by Hon. Samuel Blatchford, reprinted in 2 Ban. & A., 277, and is included in the Federal Cases, together with all the others patent cases decided in the United States Circuit and District Courts down to 1880.—West Publishing Company's Docket.

Legal Notes.

The Court of Criminal Appeals of Texas will not take judicial notice of the existence of spirits. At least, that would appear from the opinion in Nurse against the State, 128 S. W. Reporter, 906. Appellant had been convicted in the lower court of swindling by false representations. Alexander, the prosecuting witness, testified that one of the doors of his house kept making peculiar noises day and night, and both he and his wife began to see strange lights moving around near their house. The suspicion arose in their minds that money must have been buried on their premises. The matter was discussed with appellant Nurse, who offered, in consideration of the payment of $20, to find the hidden treasure. His offer was accepted, with the understanding that the treasure was to appear before he received his money. So one evening he came over, and after digging a while unearthed the sum of $42, or at least the evidence of the prosecuting witness was to that effect. He said he heard the rattle of the coin and saw some of it, but was not allowed to have any of it in his hands, as it was said to be necessary that it be reburied in order to prevent the spirits from being disconcerted and coming back and removing the balance of the treasure which had not yet been unearthed. Alexander was so well satisfied, however, with his bargain that he paid Nurse his fee; but somehow or other Mr. Nurse did not bring around any buried treasure, and, when an investigation was made for that which had been once discovered and reburied, iron washers were found instead. Alexander then charged that Nurse had fixed up the scheme with the intention of reburying the money and coming back and stealing it at night. He seemed perfectly satisfied of the original discovery, but objected to the subsequent removal. The Court of Criminal Appeals decides that there is no necessity of raising any question as to Nurse's ability "to call up spirits from the vastie deepe," but that in the present state of the record the evidence shows that Alexander got about what he bargained for, and, whether the money was stolen by Nurse or not, he could not be held for swindling on the ground of fraudulently agreeing to do and accepting compensation for doing something which the one who was supposedly defrauded testified that he really did do.

Some time ago the Gillette Safety Razor Company brought an action for infringement in England against A. W. Gamage, Ltd. (26 R. P. C. 745). The patent was held to be invalid. The plaintiff, the Gillette Safety Razor Company, recently applied for liberty to amend their specification by way of disclaimer, and to use the amended specification in the prosecution of pending infringement actions. The Court held that, since the amendment would not broaden the patent, leave to amend should be granted. The case is valuable in showing how patents are construed in England, and just what was patentable in the Gillette invention in England. As every one knows, the blade of a Gillette safety razor is made of very thin sheet steel secured to a holder, in which it is held in proper position with respect to the guard, and yet with sufficient rigidity for the purpose of shaving. This thin flexible blade, which takes the place of the old thick rigid blade, can be made of so small an amount of metal and at such a low price, that when one of the blades becomes dull, it may be simply thrown away and its place taken by a new sharp blade at slight expense. One of the chief features of the invention is the adjustability of the blade in the holder. The cutting edge or edges may be made to approach or recede from the guard by varying the transverse curvature of the blade. In the original specification it was stated: "Although this invention is particularly adapted and intended for safety razors, yet the thin double-edged flexible blade may be secured, substantially as above described, to any suitable construction of backing provided with a handle, provided the holder is adapted to supply the necessary rigidity to the blade at its cutting edges. So, too the form of holder above described is capable of considerable modification without departing from this feature of the invention." The claims were drawn in accordance with this broad statement of the scope of the invention. In amending the patent, the Gillette Safety Razor Company has limited the invention entirely to safety razors, by canceling from the specification not only the passage which we have quoted, but also those claims and portions of claims in which a thin flexible blade is broadly claimed, whether it is adapted to the Gillette safety handle or any other handle, or combined with a guard. As amended, the patent covers practically the invention as it is familiar to the public; in other words, the detachable combination of a thin flexible blade with a holder, the adjustable feature whereby the curvature of the cutting edge can be regulated, the double-edged guard, and handle located between the edges of the guard. The outcome of the patent infringement suit based upon this amended patent will be watched with interest, not only because it involved the validity of a patent covering a most important invention, but also because of the status of such amended patents in English courts.

Brief Notes Concerning Inventions.

A receiving teller's cash register was recently suggested by a bank president as something to be desired in banks, building associations, and other business houses where deposits are received and entries made in the depositors' books. The register should have means for entering the deposits in the pass books, and for duplicating such entries for the bank, together with a record of the corresponding depositor, together with the usual registering and totalizing devices common to the ordinary cash register of commerce.

In order to overcome the difficulty of cleansing a milk bottle thoroughly, a "bottomless" bottle has recently been invented. The device consists of a tube formed like a bottle, but open at each end, so that all parts of the interior are readily accessible. When the bottle is to be used, a paraffined paper disk is fitted into the larger end of the tube to serve as a bottom, and is held securely by means of stiff spring metal strips. After the bottle has been filled, it is closed in the usual way by means of a paraffined paper cap. The caps and bottoms, being made of paper, may be discarded after use, and new ones may be employed with every fresh use of the bottle.

An English patent has been granted for an apparatus for storing and delivering inflammable liquids. The patent relates to apparatus of the type in which a main storage vessel below ground is periodically filled from portable barrels which may be connected to the supply pipe for that purpose, the delivery of the liquid from the underground vessel being effected through a rising pipe by forcing in an inert gas such as carbon dioxide. In order to prevent the admission of air into the storage vessel, a cock in the supply pipe is connected to a cock in the delivery pipe, so that when one is open the other is closed. Thus during delivery, air cannot be drawn in through leaks or faulty connections between the supply pipe and the barrel. The cocks are normally held by a spring in the position for delivery, and are turned automatically into the position for supply when a barrel is placed in position and connected up.

True joint invention is thought by most lawyers to be of rare occurrence, and to determine whether it does or does not exist in a particular case presents, indeed, many times a perplexing problem. When one considers the great inventors Whitney, McCormick, Morse, Graham Bell, and Edison, one recalls that they worked out their important inventions alone. While the question is not raised by the Patent Office, which does not go back of the oath of the joint applicants, it is frequently developed in court and interference proceedings. Therefore, applicants before making an application for patent jointly, should consider carefully whether they have produced the invention by a joint inventive act, or whether, as is frequently the case, one invented solely one independent part of an apparatus, and another invented solely another independent part of the same general apparatus. Indeed, it is difficult to conceive in most cases how two, three, or more minds can unite jointly in the mental act which is so important a part in the production of an invention.

Assignments as recorded in the record of transfers of patents in the U. S. Patent Office should serve to some degree, at least, as an indication of the commercial interest in and transactions affecting patents. In the year 1909 the Patent Office received for record 29,627 papers in the nature of transfers of interests in patents. There are at this time 465,919 patents in force, and there were approximately 450,000 patents in force in 1909; so that during the year 1909 there was one transfer filed for record for about each fifteen patents in force. Some single assignments have been recorded affecting more than five hundred patents, and many have been recorded affecting each from one hundred to three hundred patents, and these should more than offset the relatively few assignments filed for record affecting trade marks and designs. It is also to be considered that most of the 450,000 patents in force in 1909 had been subjects of transfers during the sixteen years prior to 1909, and that, in addition to the papers recorded, there were many transactions, profitable to the inventor, in the way of shop rights and licenses, which are not required by law to be recorded, all of which demonstrates the tremendous value of patent property, so universally acknowledged by all who give the matter the careful thought it deserves.

RECENTLY PATENTED INVENTIONS.

Of Interest to Farmers.

CATTLE-STANCHION. — J. B. FORWOOD, Forest Hill, Md. This invention is an improvement in the class of cattle stanchions in which a series of stanchions proper are adapted to be operated simultaneously, for securing or releasing a corresponding number of cattle. The object is to provide a separate locking and releasing mechanism for the removal bar or bars of one or more stanchions.

APPLE-GRADING MACHINE.—G. L. BEDKER, North Yakima, Wash. The object of this invention is the provision of an apple grading machine which will automatically separate the fruit in accordance with predetermined measures, distributing the apples into piles of like size. The arrangement of the different grades will secure results much more perfect than could be had by hand.

Of General Interest.

BOX-LID HOLDER.—M. DAVIDSON, Ogden, Utah. An object here is to provide a device for holding in position the lids of boxes, such as cigar boxes, when placed in a showcase, such device being capable of instant attachment to the lid without the use of any tools. Means provide for lifting a box from its position without interfering with the remaining boxes in the case.

DENTAL SPATULA.—DR. B. R. SHOFF, Washington, Conn. The invention here illustrated provides an improved dental spatula for waxing artificial teeth preparatory to the vulcanizing operation. The spatula is provided with a receptacle or reservoir from which the

DENTAL SPATULA WITH WAX RECEPTACLE.

wax is freely fed to the work when the spatula is heated. The shape of the spatula is such as to render it accessible to all portions of the plate and teeth where manipulation is necessary.

BIN.—W. B. LEIBE and A. P. BONNAFFONS, New Orleans, La. The object of the invention is to provide a bin which is normally disposed above a shelf, the bin being provided with supports by which it may be readily tilted forward and downwardly, to enable the removal of merchandise, the bin being surrounded by a casing when disposed over the shelf, the casing fitting the bin to prevent any dust or foreign matter from entering.

AUTOMATIC TREMBLER PARTICULARLY APPLICABLE TO WARNING APPARATUS.—E. TENTE, 18 Rue des Bois, Paris, France. The present improvement relates to an automatic trembler, capable of being applied to all forms of acoustic warning apparatus operated by air, gas, or steam, such as trumpets, horns, whistles, etc. This trembler is mounted in such a manner that the warning apparatus can produce at will either uniform or tremulous sounds, and it also enables the emission of sound to be entirely suspended.

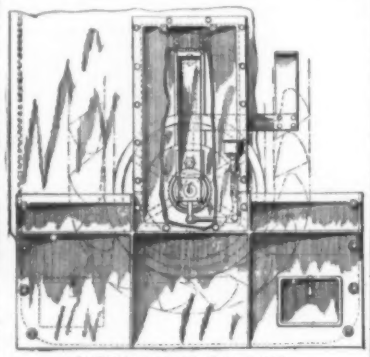
Machines and Mechanical Devices.

ATTACHMENT FOR FLAT-SURFACE GRINDING-MACHINES.—M. J. NEUMUTH, New York, N. Y. The object of this invention is to provide a new and improved attachment for flat surface grinding machines, whereby the articles to be ground can be conveniently held in place and set to any desired angle relative to the face of the grinding wheel.

IMPALING-ROLL.—E. L. CHADDOCK, Fresno, Cal. An object of this invention is to provide a simple, strong and efficient roll for use in seeding machines and the like, which is inexpensive to manufacture, which can be easily repaired, and which comprises a plurality of separable sections which can be assembled and taken apart with little trouble and loss of time.

PICKING MECHANISM.—L. E. MELLOR and F. W. COLE, Guilford, Maine. The invention pertains to power looms, and the object is to provide a mechanism, arranged to insure a proper motion of the picker stick without requiring leather straps or the like, and to permit of adjusting the sweep stick relative to the picker stick according to the power to be given to the picker stick for sending the shuttle through the open shed with more or less force.

ELEVATOR BOOT.—C. W. UTZMAN, 94 State Street, Grand Rapids, Mich. The elevator boot shown partly in section herewith, is so arranged that the belt or chain will be tightened without increasing friction on the bearings. The part that takes the wear is removable. A positive feed of the lubricant is provided, and the lubricant is maintained in a



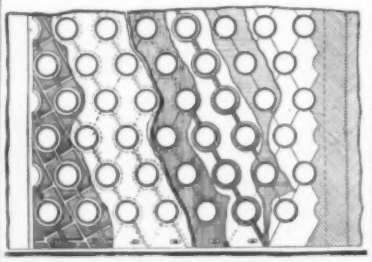
IMPROVED ELEVATOR BOOT.

dust-proof receptacle. The operating parts are contained within a protecting casing, in which provision is made for inspection and alteration of the construction.

NEEDLING-MACHINE.—D. S. BROWN, Watertown, N. Y. The object of the present invention is to provide a machine for massing the collar pads which are the subject of a former Letters Patent issued to Mr. Brown. The said pads are formed of a sheet of fabric material having secured thereto a layer of fibrous material, generally curled hair, portions of the hair being drawn through the fabric material whereby to secure the said layer in place.

Prime Movers and Their Accessories.

FLAME OR BAFFLE BRIDGE FOR WATER TUBE BOILERS.—A. P. GERALD, 92 Poplar Street, Jersey City, N. J. In many forms of water tube boilers, a flame or baffle bridge is mounted transversely of the tube so as to cause the flames or gases of combustion to travel between the tubes in one direction, to

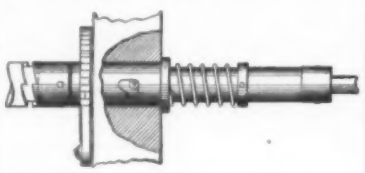


FLAME OR BAFFLE BRIDGE FOR BOILERS.

the baffle, and then back between the tubes upon the opposite side of the baffle. The baffle bridges are usually made of tiles supported by a cast metal backing. This is frequently warped or burned away. The object of the present invention is to overcome this difficulty by using layers of tiles, including a series of strips of heat-resisting material.

Pertaining to Vehicles.

CRANKING DEVICE FOR INTERNAL COMBUSTION ENGINES.—ELBERT CLINTON, Box 4, Hamden, Conn. This invention is calculated to prevent injury to the operator when cranking the engine. One of the clutch members is provided with a stub shaft, on which the crank is applied. A sleeve fits over this shaft and bears a ratchet which prevents it from turning in reverse direction with the



SAFETY CRANKING CLUTCH.

stub shaft when the engine back-fires. A pin on the stub shaft enters a cam slot in the sleeve. In case the engine should back-fire, the stub shaft would be carried back with it until thrown out of engagement with the engine clutch by means of the cam slot.

TIRE-CLAMP.—B. MORGAN, Newport, R. I. The invention relates to certain improvements in tools for use in replacing vehicle tires upon the rims, and the aim is to provide means for positively and effectively clamping the tire to the rim at a point along the length of the tire, so that the flanges of the tire cannot become accidentally disengaged from the clencher flange of the rim while adjacent portions of the flange of the tire are being placed in position.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of June 18th, 1910, or will be sent by mail on request.

(12336) E. W. B. asks: Have you published in the SCIENTIFIC AMERICAN SUPPLEMENT details of the more prominent aeroplanes? A. In SUPPLEMENT Nos. 1816, 1817, 1818, 1819, 1820, 1821, and 1822 is published "The Practice and Theory of Aviation," by Grover Cleveland Loening, A.M. This is the most compact paper on aeroplanes that has probably ever been published. Fourteen biplanes and monoplanes are described in detail, and illustrated with scale drawings, namely, the Farman, Cody, Curtiss, Wright, Voisin (old model), Voisin (new model), and Sommer biplanes, and the Antoinette, Santos-Dumont, Bleriot XI, Bleriot XII, Grade, Pelterle and Pfitzner monoplanes. The proper dimensioning of aeroplane surfaces, as deduced by famous experimenters from their tests, is also considered. Taken as a whole, this series of seven papers constitutes an admirable text book. Price, 10 cents each; 70 cents for the set mailed.

(12337) S. P. A. says: Please inform me if a pump will draw water horizontally 150 feet. I think of placing my pump that distance from a running stream, and force the water for irrigating a distance of 500 feet. A. Yes, if the friction head in the pipe, plus the vertical height from the water level to the suction valves of the pump, is not over 20 to 25 feet. Ascertain the height, and then lay a pipe large enough to carry the quantity you intend to pump, with friction head not greater than the difference between the suction height and 20 or 25 feet; the smaller number is preferable, because it will give an easier working pump. Lay the pipe on an even slope, with no high spots, and put a generous air chamber near the pump to collect the air which will be carried along by the water.

(12338) E. H. G. says: Next fall I intend to enter college, and am a little undecided as to what course to take. I have had one year of chemistry in a preparatory school and liked it very much. I am thinking of continuing the study of it, but I do not know much about it as a profession. There is no chemist or anyone that knows anything about chemistry in my neighborhood, so will you kindly send me all the information that you think would be of value to me concerning the different branches, preparation for each branch, pay, and so forth? A. We are loth to advise students who are strangers to us in regard to their choice of a vocation. As a dean of college students the writer frequently advises young men as to their choice, but always with a knowledge of the aptitudes and capability of the person advised. We can only say in your case that chemistry furnishes a wide field of activity, and one must select some particular line of effort in which to perfect himself. A mastery of the whole of chemistry is impossible to anyone. After a good general knowledge of the science is obtained, you can select some line and follow it out as a life work. In electro-chemistry are many such fields. Your present duty is to begin, get as broad and deep an education as you can, and then specialize, after you have measured yourself better than now, and follow out your bent. You will in this way make a successful man. As to pay, better not think of that now. The pay of a first-class man is all right in any calling. Think now of becoming a first-class man.

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Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., Inc., 361 Broadway, New York.

A NEW TEAZER COTTON GIN.

(*Concluded from page 496.*)

roller, while two strippers moving up and down in opposite directions separate out the seeds and other undesirable material, so that the ginned cotton comes from the machine in its full natural length of fiber without being cut or broken and without kinks.

With long fiber staple it is claimed that the machine can do twice the amount of work and at the same time turn out a superior grade of cotton to that of the roller gin; while with upland cotton, which the ordinary roller gin is unable to handle, less is ginned, yet the increased length of fiber and the better condition of the lint give increased value to the product. The difference between the cotton ginned by the old processes and by the teazer gin is apparent at a glance. It is loose and fluffy, with longer and straighter fibers, so much so, in fact, as to arouse the interest of many spinners to whom this condition appeals. The seeds and refuse are stripped clean, and do not need to go back for a second ginning to remove any clinging fiber. Numerous other economies are claimed for this new machine, which for its operation requires less power than the ordinary roller gin.

HOW AEROPLANE RECORDS ARE MADE.

(*Continued from page 500.*)

attained, consists of an aneroid barometer in combination with a recording clock and the necessary connecting parts. The aneroid barometer consists of a very delicately made and adjusted vacuum box, *A*, whose movements, actuated by the pressure of the atmosphere, are transmitted through a series of multiplying levers *B C E*, to a moving pen which travels over a chart, *G*, graduated in millimeters and representing meters of ascent. This chart is wound upon the clock drum, and revolves slowly beneath the recording pen. American barographs are graduated in inches and hundredths of an inch, representing feet of ascent.

Roughly speaking, a mercury barometer falls one inch for every 900 feet of ascent, as can be seen from the following table compiled at mean atmospheric pressure in latitude 40:

Height above Sea-Level.	Fall in Barometer.
917 feet	1 inch
1,860 feet	2 inches
2,830 feet	3 inches
3,830 feet	4 inches
4,861 feet	5 inches

In strictly accurate observations it is necessary that the barograph should be used with certain corrections. Being compensated for temperature, the instrument requires no correction for the effect of temperature on the instrument itself, but it does require a correction for the effect of temperature on the atmosphere, which need only be considered when the temperature is above or below 50 deg. F.

The reading of the barograph will be affected by the atmospheric pressure, the instrument being adjusted for an atmospheric pressure at sea level of 29.92+.

In reading the barograph it is usual to apply for correction of temperature the carefully worked out tables by Sir G. Airy, the late Astronomer Royal of England.

In making the tests of the Richard barograph used by Mr. Drexel in his flight, the instrument was carefully tested by the experts of Queen & Co. (who make a similar barograph) in the presence and with the assistance of the expert of the Weather Bureau. This was done by placing the instrument in vacuum in a large air pump to which is connected a mercurial column which was carefully adjusted and corrected for temperature, altitude, and capillarity.

By exhausting the air, the instrument was passed through all the changes of atmospheric pressure from sea level to an exhaustion corresponding to 15,000 feet of elevation, and was found to move in absolute coincidence with the mercurial column. The inclosing cover having a glass front and permitting the instrument to be seen but not touched, was then sealed, and the barograph used in that condition by Mr. Drexel in his flight for the altitude record.

The barograph was then brought again to the laboratory of Queen & Co., where it was subjected to a similar test and found in good order and correct in its indications.

The following gives the results of the examination made: The difference in the air pressure between the upper and lower stations on the barograph record was 9.302 inches. At the time of the ascension the pressure at the lower station as indicated on the record was 30.05 inches. The record at the upper altitude was 20.75 inches, giving a difference of 9,929 feet on the basis at sea level of 29.90 inches at a temperature of the air of 50 deg. Making a correction to pressure of lower station (plus 136 feet), correction to mean temperature of the air column (minus 205 feet), correction for gravity at Philadelphia, the latitude of which is 40 deg. (plus 5 feet), correction for moisture in the air column (plus 32 feet), we have 9,929 + 136 + 32 + 5 — 205 = 9,897 feet, as the final result.

The temperature of the upper air is of some importance in the calculation of these results and it is unfortunate that no recording thermometer was carried to give this data, but it happened that at the time of Mr. Drexel's flight the United States Weather Bureau had their temperature kites flying from Mt. Weather at an altitude of about 13,000 feet and with air currents flowing directly from the southwest to Philadelphia. It was thus possible to apply an accurate correction for the temperature of the upper air stratum, there being at that altitude no local conditions to affect the result.

From the above it will be seen that the making of an altitude record with a barograph is a very delicate matter. Aside from the derangement of the instrument from jolts when the aeroplane is starting and alighting, there are generally numerous corrections to be made before the record can be approved as correct. The barograph should be calibrated immediately before the record is made and verified very soon thereafter; and it should not be carried long distances in automobiles and railway trains, as was done with Drexel's instrument after his Philadelphia flight.

We append a list of some of the principal height records of the present year, which shows at a glance the rapid progress that has been made in aeroplane climbing this year.

AEROPLANE ALTITUDE RECORDS IN 1910.

Dates.	Aviator.	Machine.	Country.	Altitude. Feet.
Jan. 7.	Latham.	Antoinette monoplane.	France.	3,280
Jan. 12	Paulhan.	Farman biplane.....	U. S.	4,165
July 9.	Brookins.	Wright biplane.....	U. S.	6,171
Aug. 11	Drexel.	Blériot monoplane.	England.	6,600
Sept. 3.	Morane.	Blériot monoplane.	France.	8,471
Sept. 8.	Chavez.	Blériot monoplane.	France.	8,485
Oct. 3.	Wynmalen.	Farman biplane	France.	9,104
Oct. 31.	Johnstone.	Wright biplane.....	U. S.	9,714
Nov. 23	Drexel.	Blériot monoplane.	U. S.	9,897
Dec. 9.	Legagneux.	Blériot monoplane.	France.	10,499

The New Mexico Range Caterpillar.

A new range caterpillar which was reported as damaging the ranges in New Mexico has been investigated by the representative of the U. S. Department of Agriculture, and a report of those observations has just been issued as Bulletin 85, Part V, Bureau of Entomology.

The first intimation of the alarming increase of Hemileuca caterpillars in northeastern New Mexico reached the Department in August, 1908, and before the end of October of that year the outbreak

was under the careful study of an expert. Therefore, the report covers the adult period of this depredating insect in 1908, and the entire active life period of 1909.

The history of the range caterpillar, now designated as *Hemileuca oliviæ* Cockrell, prior to this outbreak is very vague, and probably, owing to the fact that they have not been able to distinguish between these caterpillars and those of other species, the information furnished by ranchmen and others is very unreliable. The species may have had its origin in the country east and adjacent to the Rocky Mountains in northeastern New Mexico. The first authentic history of the genus Hemileuca in New Mexico begins about five or six years ago, and the section around Springer Lake, an irrigation reservoir a few miles from Springer, a station on the Santa Fe Railway, 50 miles south of the Colorado line, appears to have been the starting point of the present outbreak, and from there it has spread north, east, and south.

The area at present is not well defined, but it is known to extend from just north of Las Vegas, N. Mex., on the south to Las Animas, Colo., on the north, and from Cimarron and Kochler, N. Mex., on the west to points within the Texas "Panhandle" on the east; or over an area 200 miles from north to south by 150 miles from east to west, comprising about 30,000 square miles.

All of this area is not evenly infested, but the insect is more or less prevalent everywhere. Counts made at widely distant points of the caterpillars present on a measured rod showed enormous numbers on this range, in some cases as high as 20,000,000 to the square mile, justifying as conservative an estimate of 1,536,000,000 caterpillars depredating on the infested area. A number capable of tremendous possibilities for harm, especially when it is remembered that the full-grown larvæ frequently measure 2½ inches in length with the diameter of a man's index finger, and are so numerous that one really has to choose his steps to avoid crushing the huge, spiny, ugly caterpillars. And the sensation produced when it becomes necessary to walk miles through their myriads is both peculiar and lasting.

The bulletin treats fully of the identity, life history, natural enemies, and remedial measures, and states that further observation and study will be necessary before it can be determined whether the species will retain its foothold in adjacent States to the north and east and continue to spread, or whether, owing to high altitude and consequent atmospheric and meteorological conditions, it will be restricted to the particular section of the country now infested.

New Paper Materials.

For many years experts of the Department of Agriculture have been engaged to devise some method for producing in a satisfactory manner, paper from corn stalks, cotton stalks, bamboo and other fibers.

It has been estimated by experts that the supply of wood fiber for the making of paper would last but a few years more, and experiments have been carried on every day for a substitute for wood pulp.

Experiments of this nature have just been completed by scientists of the Department of Agriculture, with a view to solving the problem of a future paper supply for America.

These experiments were carried on in a government paper factory in Maine, and were in every way satisfactory. Those making the experiments, working under authority of Congress, who appropriated something like $20,000 for that purpose, are confident that they have found the means by which the waste cornstalks from our farms can be converted into paper of the finest quality. The samples of paper derived from cornstalks rank with the highest grades of book and writing papers on the market,

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PROFITABLE OPPORTUNITY.—For sale, patent of self-balancing Ship-Table—keeps an "even keel" regardless of ship's motion. Universally needed. Vast profits. A. M. Gustafson, Box 781, Bisbee, Arizona.

Inquiry No. 9207.—Wanted, names and addresses of firms making star section iron and steel suitable for lightning rods.

HELP WANTED.

Inquiry No. 9208.—Wanted, the address of the manufacturer of the "Little Giant" Pump.

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Inquiry No. 9209.—Wanted, names of owners of gold placer properties.

WANTED.

Inquiry No. 9210.—Wanted, names of owners of deposits of pumice or volcanic ash.

WANTED.—Position as draughtsman on machinery; German born. 4 mos in America, age 28, can give best reference. K. S., Herman's Bakery, Milltown, N. J.

Inquiry No. 9211.—Wanted, addresses of parties who can ship ore containing, vanadium, molybdenum, or bismuth.

WANTED.—January 1st next experienced traveling man to represent the very best Vacuum Cleaner on the market. Portable, Semi-Portable and Stationary. Victor Cleaner Company, York, Pa.

Inquiry No. 9212.—Wanted, names and addresses of owners of fluor spar properties.

LISTS OF MANUFACTURERS.

Inquiry No. 9213.—Wanted, addresses of parties making Viscol compound for shoes or shoes made from leather treated therewith.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9214.—Wanted, address of maker of "Plako," a fastening for ladies' dresses.

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Inquiry No. 9215.—Wanted, machine for producing a good finish on hammer and other handles.

Inquiry No. 9216.—Wanted, to buy a sewing machine having a very long arm for special work.

Inquiry No. 9217.—Wanted, the names and addresses of manufacturers of machinery for shelling almonds and peanuts.

Inquiry No. 9218.—Wanted, the names and addresses of manufacturers of outfits for salting almonds and peanuts.

Inquiry No. 9219.—Wanted, names and addresses of manufacturers of bags, cartons, and oiled and waxed paper for marketing salted almonds and peanuts.

Inquiry No. 9220.—Wanted, the names and addresses of manufacturers of plants for the preparation and mixing of baking powders; also dealers in ingredients for making the powder, manufacturers of cans, labels, etc., for packing baking powder for the market.

Inquiry No. 9221.—Wanted, names and addresses of owners of mica properties.

Inquiry No. 9222.—Wanted, names and addresses of owners of white silica sand deposits.

Inquiry No. 9223.—Wanted, to buy machinery for making sugar of milk.

Inquiry No. 9224.—Wanted, to buy a motor driven floor scrubbing machine.

Inquiry No. 9225.—Wanted, a concern able to grind and polish hammers.

Inquiry No. 9226.—Wanted, to buy a machine for making flat-sided popcorn cakes.

Inquiry No. 9227.—Wanted, a power-driven saw for cutting down pine trees twenty inches in diameter.

Inquiry No. 9228.—Wanted, to buy fabric tufting machines.

and have proven its strength, quality and durability.

The fact that paper can be made out of cornstalks is not considered the most important result of these experiments, but has demonstrated the fact that paper can be made from almost anything that has a long fiber. Broom corn, rice straw, cotton stalks, bamboo and other kinds of grasses have been utilized to make paper.

Several years ago a process was patented whereby cotton stalks were treated by a special process and turned into a paper of good commercial quality. It was demonstrated that the fiber of the cotton stalk and limb of the cotton plant is considerably stronger than spruce wood fiber, and that it is almost as strong as the fiber of the flax plant, thus making it possible to produce from a heretofore waste product, paper superior in strength and texture to that of ordinary wood pulp paper, and nearly as strong as high-grade linen paper.

In the case of corn stalks, as in the case of cotton stalks, the production of paper is from a heretofore waste product, and with the supply at hand, a new industry could be established.

In order that the paper question may be thoroughly worked out, the experts of the Department of Agriculture have gathered all sorts of farm waste and plants from all parts of the United States, and these will be tested as to the possibilities of each for paper making.

Other tests will be made of esparto, a grass which is a native of northern Africa and which is extensively used now in southern Europe. Paper from this grass has been used by newspaper companies in England. Rice roots, wild grass and other plants from Japan and China will form the basis of further tests to be made.

Mountains Under the Sea.

It was at the captain's table on an Atlantic liner that a young woman idly inquired just how far the ship was from the nearest land. Several passengers would have said offhand, "About eight hundred miles." But the captain referred the question to a quiet gentleman, who looked at his watch and a chart, and amazed his hearers by answering, "Just about seventy yards."

"The land I speak of," continued the captain's friend, who was an expert oceanographer, "is just thirty-six fathoms beneath this ship. It is the summit of the Laura Ethel Mountain, which is twenty thousand feet above the lowest level of the Atlantic basin. If it were some two hundred feet higher, or the sea were two hundred feet lower, you would call it an island."

In effect, the Atlantic is a huge continent boasting a superficial area of twenty-five million square miles. It is nine thousand miles long and two thousand seven hundred broad. The depth of the water that covers it is by no means so considerable as people used to imagine. Oceanography as a science may be said to date from only about 1850; but, thanks chiefly to the labors of the cable-laying and cable-repairing ships, our knowledge of the configuration of the bed of the ocean grows greater every year.

The Laura Ethel Mountain, discovered in 1878, is the uppermost peak of one of the most celebrated of the submarine elevations in the Atlantic. Mount Chaucer, at the eastward of it, was revealed to oceanographers in 1850. Sainthill, which is westward of both, has the honor to be the first mountain discovered in the Atlantic. It became known to science in 1832.

Prior to the laying of the first Atlantic cable, Lieut. Maury, U.S.N., made it known that a wide plateau exists beneath the ocean, running from Ireland to Newfoundland. It seemed so admirably suited to the purpose of cable laying that he modestly called it Telegraphic Plateau; but in the newest charts it bears the discoverer's name.

The location of "Davy Jones's locker"

might be said to have been established with the discovery of Sainthill. It has been estimated that at the base of this eminence the relics of not fewer than five thousand wrecks lie scattered. Or one might ascribe that gruesome distinction to the Faraday Hills, discovered in 1883, and lying between Mount Chaucer and Laura Ethel Mountain. These hills are noted among oceanographers for the amount of wreckage of which they are the monuments.

There are cavernous depths, of course, in the Atlantic, as well as majestic heights. Four miles and a half may be taken to be the greatest. The average is probably about two English miles. Heights and depths alike are merely hidden land, which may some day be exposed by the mighty workings of nature.

Meantime comparatively few changes go on. Beneath the ocean there are no frosts, no lightnings, no glaciers, no meteorological agents at work. If it were not for the eddies, and the destruction and accumulation of animal life, these Atlantic hills and vales might rest as immutable as the "peaks and craters of the moon," where there is no atmosphere to cause decay.

American Experiment in Camphor Cultivation.

For some time past the government has been experimenting with camphor trees, and so successful have these experiments proved, that a tract of land has been acquired in Florida which is being set with camphor trees. There seems to be no doubt that camphor may be successfully and profitably grown in several of the Southern States as well as in California.

There are two recognized species of the camphor tree. One is a native of Borneo, and produces the finest grade of camphor, used principally for medicinal purposes; the other is found in Japan and Sumatra, though native to the first-named country. This is the tree that furnishes the bulk of the camphor of general commerce, and is known as the *Camphora officinarum*. The Japanese camphor tree resembles the bay tree very much, being a handsome and ornamental tree, bearing black or purple berries, and it is this tree which it is intended to establish in the United States.

The profit per acre on camphor trees is considerable, and the market is not apt to become overstocked, as, besides its medicinal uses, camphor is an essential ingredient in the manufacture of smokeless powder. At the present time Japan has a practical monopoly, and should a non-camphor-producing nation become involved in a long-continued war with the Island Empire, it would be confronted by a serious problem.

The old method of securing camphor gum necessitated the cutting down of the tree, but it has been demonstrated that this is entirely needless, inasmuch as by a distilling process gum may be obtained from leaves and twigs, which may be gathered without injury to the tree.

Wireless on Battleships.

A very complete system of wireless telegraph and telephone apparatus has just been installed on the French battleships "Verité" and "Justice." The two battleships are to proceed to Algeria, and from there will be made various experiments between the Algerian and Tunisian coasts, Corsica, and France. Owing to the high power of the new apparatus, we may expect to see some interesting results. Lieuts. Collin and Jeance, whose new wireless telephone method we have illustrated, are actively engaged in this work.

To Cut Glass.—Pass a hempen cord, soaked in turpentine, over the place where it is desired to cut the glass, light it and sprinkle the glass with cold water, whereupon a slight pressure will suffice to break it sharply along the line followed by the cord.

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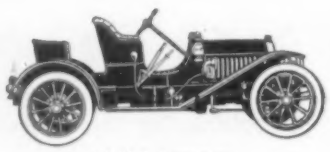

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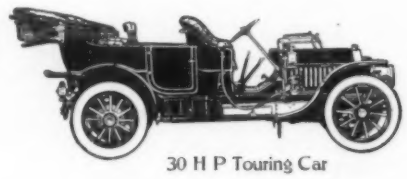

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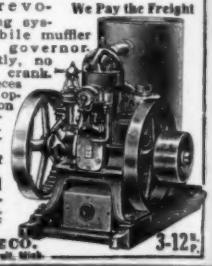

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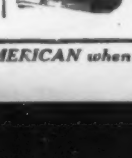

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